Five County Association of Governments

Natural Hazard Mitigation Plan

A Regional Approach
for Southwestern Utah

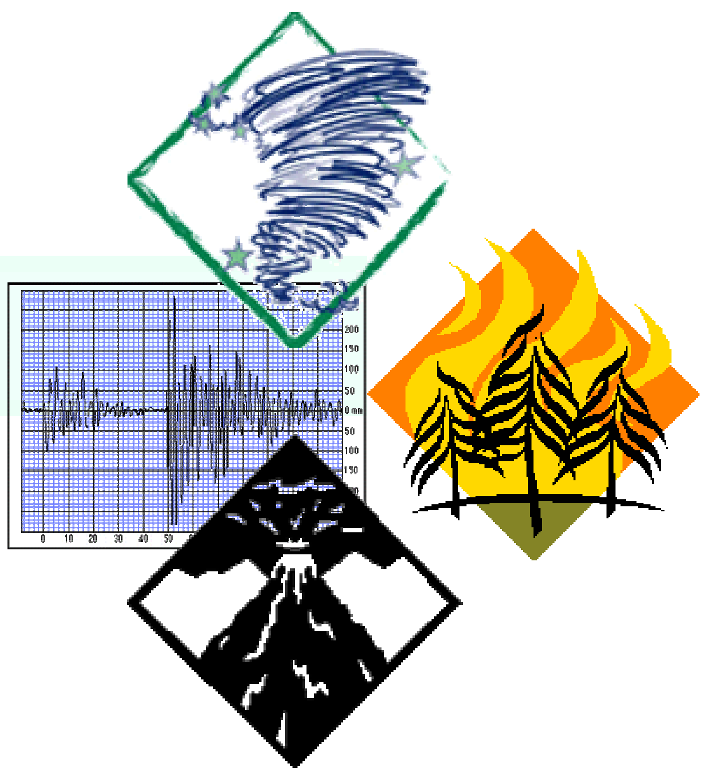


Table of Contents

Executive Summary
The mission of the Five County Association of Governments (FCAOG) Natural Hazards Mitigation Plan is to substantially reduce the vulnerability of communities, within the region, to natural hazards. The plan is intended to promote sound public policy designed to protect citizens, private property, critical facilities, and infrastructure. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities to guide the community towards the development of a safer community.

Plan Organization
The FCAOG Natural Hazards Mitigation Plan was developed and organized within the rules and regulations established under 44 CRF 201.6. The plan contains a discussion on the purpose and methodology used to develop the plan, a profile on communities within FCAOG, as well as a hazard identification study and a vulnerability analysis of ten hazards. To assist in the explanation of the above-identified contents there are several appendices included which provide more detail on specific subjects. This is intended to improve the ability of communities within the FCAOG planning district to address hazards and will document valuable local knowledge on the most efficient and effective ways to reduce loss.

Plan Financing
The FCAOG Plan has been financed and developed under the Pre-disaster Mitigation (PDM) Program provided by the Federal Emergency Management Agency (FEMA) and the Department of Public Safety Division of Emergency Services and Homeland Security (DESHS). The FCAOG aided in funding, providing in-kind assistance to local governments.

Plan Participation
The FCAOG Natural Hazards Plan has been completed with participation and guidance from the FCAOG Regional Hazard Mitigation Team and as a result of a collaborative effort between the Five County Association of Governments, Department of Public Safety Division of Emergency Services and Homeland Security, public agencies, and the citizens, elected officials, and public employees of the cities and towns within Beaver, Garfield, Iron, Kane, and Washington Counties. Questionnaires were provided community leaders, and workshops and public meetings were conducted during plan development. Public Participation for any planning project is vital and care was taken to provide many opportunities for public comment and participation. Comments, questions, and discussions were given strong consideration in the development of this plan. This multi-jurisdiction mitigation plan was completed with assistance and input from:

Beaver County
Emergency Manager
LEPC
NRCS
Beaver City
Milford City
Minersville Town

Garfield County
Emergency Manager
LEPC
Antimony Town
Boulder Town
Cannonville Town
Hatch Town
Henrieville Town
Escalante City
Panguitch City
Tropic Town

Iron County
Emergency Manager
LEPC
Brian Head Town
Cedar City
Enoch City

Kanarraville Town
Paragonah Town
Parowan City

Kane County
Emergency Manager
LEPC
GIS Department
Alton Town
Big Water Town
Glendale Town
Kanab City
Orderville Town

Paiute Indian Tribe of Utah
PERC
Cedar Band Council
Indian Peaks Band Council
Shivwits Band Council

Washington County
Emergency Manager
Washington City LEPC
Enterprise City
Hildale City
Hurricane City
Ivins City
LaVerkin City
Leeds Town
New Harmony Town
Rockville Town
St. George City
Santa Clara City
Springdale Town
Toquerville Town
Virgin Town

Hazards Identified
Natural Hazards to be addressed in the plan were determined at a meeting of the FCAOG Regional Hazard Mitigation Team. The Team recognized the following hazards as being the most significant to the counties and towns within the FCAOG planning district: Wildfire; Landslide; Flood; Earthquake; Volcanoes; Drought; Problem Soil; Severe Weather; Insect Infestation; Radon Gas

Plan Goals
In an effort to ensure that the mission of the FCAOG PDM Plan is met, the participants in the development of this plan defined and established a list of goals, which are directly relevant to meeting the mission of the plan. The following is a list of the goals identified by the participants of this plan:

- Protection of life before, during, and after the occurrence of a disaster.
- Preventing loss of life and reducing the impact of damage where problems cannot be eliminated.
- Protection of emergency response capabilities (critical infrastructure)
- Communication and warning systems
- Emergency medical services and medical facilities
- Mobile resources
- Critical facilities
- Government continuity
- Protection of developed property, homes and businesses, industry, education opportunities and the cultural fabric of a community, by combining hazard loss reduction with the community’s environmental, social and economic needs.
- Protection of natural resources and the environment, when considering mitigation measures.
- Promoting public awareness through education of community hazards and mitigation measures.
- Preserving and/or restoring natural features that provide mitigation such as floodplains.
- Minimize the impacts of flooding

- Minimize the impacts of drought
- Minimize the impacts of severe weather
- Minimize the risk of wildfire

Purpose
To fulfill federal, state, and local hazard mitigation planning responsibilities; to promote Natural Hazard mitigation measures, short/long range strategies that minimize suffering, loss of life, and damage to property resulting from hazardous or potentially hazardous conditions to which citizens and institutions within the state are exposed; and to eliminate or minimize conditions which would have an undesirable impact on our citizens, the economy, environment, and the well-being of the Region. This plan is an aid in enhancing city and state officials, agencies, and public awareness to the threat that hazards have on property and life. It identifies what can be done to help prevent or reduce the vulnerability, risk and impact of natural hazards. Another function of this Plan is to provide information to local jurisdictions regarding the availability of funding sources for natural hazard mitigation projects. A partial listing of funding sources is included in this plan as Appendix H.

Scope
The FCAOG Natural Hazard Mitigation Plan was developed in accordance with the requirements of FEMA Section 322 regulations, DESHS, local planning and the FCAOG.

The goal of this plan is to assist the five counties of Southwestern Utah, in reducing the costs of natural disasters; namely Wildfire, Landslide, Flood, Earthquake, Volcanoes, Drought, Problem Soil, Severe Weather, Insect Infestation, and, Radon Gas through mitigation practices. This plan provides comprehensive hazard identification, risk assessment, vulnerability analysis, mitigation actions, and implementation schedule for the region.

The FCAOG met the regulations set forth by FEMA in completing the plan. Regulations, including future monitoring, evaluating, updating and implementing, will take place as new incidents occur and or every three to five years and will be included in the local mitigation plans as well.

Acknowledgements

County Commissioners
Billie Dalton, Chair- Beaver
Patrick R. Yardley
Mark S. Whitney

Maloy Dodds, Chair- Garfield
Clare M. Ramsay
Dell LeFevre

Gene E. Roundy, Chair- Iron
Dennis Stowell
Wayne A. Smith

Ray Spencer Chair- Kane
Daniel W. Hulet
Mark Habbeshaw

Alan D. Gardner, Chair- Washington
James J. Eardley
Jay Ence

PITU Tribal Council
Lora Tom, Chairwoman

Mayors
Wade Bradshaw,. Beaver City
Robert Craw, Minersville
Eugene H. Mayer, Milford
Shannon Allen, Antimony
Keith Gailey, Boulder
Alma Fletcher, Cannonville
Lenza Wilson, Escalante
Kevin Eldridge, Hatch
Riley Miller, Henrieville
Janet Oldham, Panguitch
Jean Seiler, Tropic
H.C. Deutschlander, Brian Head
Gerald R. Sherratt, Cedar City
Patrick Franks, Enoch
Randy Williams, Kanarraville
Constance Robinson, Paragonah
Ronald K. Smith, Parowan
Claren Heaton, Alton
Will Marshall, Big Water
William Spencer, Glendale
Brad Adair, Orderville
Kim Lawson, Kanab
Merrill Fisher, Enterprise
David K. Zitting, Hildale
Tom Hirschi, Hurricane
Daren Barney, Ivins
Tom Stocks, LaVerkin
Norma Gier, Leeds
Joel Webster, New Harmony
Dan McGuire, Rockville
Daniel D. McArthur, St. George
Dennis Drake, Santa Clara
Bruce Vanderwerff, Springdale
Kenneth Powell, Toquerville
Jay Lee, Virgin
Terrill Clove, Washington City

PITU Band Chairpersons
Anthonia Tom, Indian Peaks
Travis Parashonts, Cedar
Glenn Rogers, Shivwits

Regional Natural Hazards Mitigation Team
Wayne Smith-Commissioner, Iron
Clare Ramsay-Commissioner, Garfield
Merrill Fisher-Mayor, Enterprise
Les Whitney-LEPC, Beaver
Nathan Rousseau-LEPC, Garfield
Charlie Morris-LEPC, Iron
Dave Owens-LEPC, Kane
Dean Cox, LEPC, Washington
Mac Hall-Public Works, Hurricane
Jim McGuire-Planning, Washington City
Bob Hansen-Fire/EMS, Santa Clara
Bill Lund-Utah Geographical Survey
Steve Rundquist-DESHS

Beaver County LEPC & Mitigation Team
Les Whitney, County Emergency Manager
Malina Stewart, Milford FD
Eilene Craw, EMS
Valentina Ferguson, Beaver Ambulance
Twinkle Erwig, Beaver Valley Hospital
Ken Yardley, County Sheriff
Veda Cox, EMT Training Officer
Ann Pierce, County Search & Rescue
Pete Jones, Minersville FD

Teddy Bridge, Milford FD
Kathy Hendricks, USDA Farm Service
Jerry Jorgenson, SWPHD
Darrick Whipple, USDA Farm Service
Lynn Kitchen, USDA Farm Service
George Humphreys, County FD dist 1
Randy Marshall, USDA Farm Service

Garfield County LEPC & Mitigation Team
Kris Hatch, County Emergency Manager
Allen Henrie, Panguitch City Manager
Nathan Rousseau, LEPC Chair
Clint Pierson, Deputy Sheriff
Becki Bronson, Media Rep
Bob McCullough,Garfield Memorial Hospital
Chad Justus, Hatch FD
Dave Dodds, Panguitch FD
Don Porter, Escalante FD
Jens Munthe, LEPC Escalante
Karen Ott, LEPC Secretary
Kerry Alvey, Tropic FD
Mona Partridge, County Ambulance
Nick Reynolds, School District
Ron Harris, Tropic FD
Sandrea Francisco, Tropic Town
Eric Packer, Garfield Memorial Hospital
Tammy Barton, County Ambulance

Iron County LEPC & Mitigation Team
Vern Grimshaw, Tribe Mitigation Planner
Larry LaForte, Forestry, Fire & State Lands
Steve Platt, County Engineer
Kit Wareham, Cedar City Engineer
Chad Nay, County Building Inspector
Chad Reed, USU Extension Office
Charlie Morris, County Emergency Manager
Debbie Morris, County Emergency Manager
Earl Gibson, Public Works Director/ Enoch
Kelly Stones, Public Works/ Parowan
Ryan Riddle, County Fire Warden
Garry Bulloch, Brian Head Town Marshall

Kane County LEPC & Mitigation Team
Lamont Smith, Sheriff
Bev Dinsmore, Dispatch Supervisor
Mark Habbeshaw, Commissioner
Dan Hulet, Commissioner
Dave Owens, Emergency Services Director
Earl Levanger, County Fire Warden/Orderville Fire Chief
Keith Mcallister, Kanab City Manager
Kim Lawson, Kanab City Mayor
Dilworth Perkins, Kane County EMS
Jeff Mosdell, Kanab Fire /County HazMat
Alan Alldredge, Kanab Fire Chief
Doug Crosby, Kanab Police Chief
Keith Robinson, Kanab Public Works
Ken Johnson, Cedar Mountain Fire Chief
Terra Sue Robinson, Volunteer Center
Tom Corrigan, Fredonia Town

Paiute Indian Tribe of Utah PERC
Tara Marlowe, Environmental Officer
Delice Tom/Jackie Bow, Cedar Band
Robert Borchardt, Indian Peaks Band
Cordelia Wall, Shivwits Band

Washington County LEPC & Mitigation Team
Dean Cox, County Emergency Director
Ron Sappington, County Assistant
Dave Patterson, Asst. County Attorney
Bryan Bracken, BLM
Esther Benson, BLM
Rich Caulfield, American Red Cross
Matthew Brower, Santa Clara City Mgr
Robert Hansen, Santa Clara City PS
Mike Vercimah, Hurricane City Pub. Works
Lynn Excell, Hurricane City PD
Ed Campbell, Hurricane City FD
Wade Carpenter, Ivins City PS
Jeff Dial, St. George City PD
Jason Jolley, SWUPHD
Ron Whitehead, Washington County PW
Hal Carlson, St. George City EM
Roland Barlow, Hildale City FD

State DESHS staff
Ryan Pietramali, Planning Coordinator
Steve Rundquist, Five County Area Rep.

Five County AOG staff
John Williams, Executive Director
Curt Hutchings, Project Manager
Gary Zabriskie, Associate Planner
Edward Dickie, GIS Coordinator

Introduction

The State of Utah is vulnerable to natural, technological, and man-made hazards that have the possibility of causing serious threat to the health, welfare, and security of our citizens. The cost of response to and recovery from potential disasters can be lessened when attention is turned to mitigating their impacts and effects before they occur or re-occur. This Natural Hazard Mitigation (NHM) Plan is the initial step in identifying natural hazards and the impacts they may have on the residents of the Southwestern District of Utah.

What is Hazard Mitigation

Hazard mitigation is defined as any cost-effective action(s) that have the effect of reducing, limiting, or preventing vulnerability of people, property, and the environment to potentially damaging, harmful, or costly hazards. Hazard mitigation measures, which can be used to eliminate or minimize the risk to life and property, fall into three categories. First; are those that keep the hazard away from people, property, and structures. Second; are those that keep people, property, and structures away from the hazard. Third; are those that do not address the hazard at all but rather reduce the impact of the hazard on the victims such as insurance. This mitigation plan has strategies that fall into all three categories.

Hazard mitigation measures must be practical, cost effective, and environmentally and politically acceptable. Actions taken to limit the vulnerability of society to hazards must not in themselves be more costly than the value of anticipated damages.

The primary focus of hazard mitigation actions must be at the point at which capital investment decisions are made and based on vulnerability. Capital investments, whether for homes, roads public utilities, pipelines, power plants, chemical plants or warehouses, or public works, determine to a large extent the nature and degree of hazard vulnerability of a community. Once a capital facility is in place, very few opportunities will present themselves over the useful life of the facility to correct any errors in location or construction with respect to hazard vulnerability. It is for these reasons that zoning ordinances, which restrict development in high vulnerability areas, and building codes, which insure that new buildings are built to withstand the damaging forces of hazards, are the most useful mitigation approaches a city can implement.

Previously, mitigation measures have been the most neglected programs within emergency management. Since the priority to implement mitigation activities is generally low in comparison to the perceived threat, some important mitigation measures take time to implement. Mitigation success can be achieved, however, if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management. Hazard mitigation is the key to eliminating long-term risk to people and property living in Utah from hazards and their effects. Preparedness for all hazards includes response and recovery plans, training, development, management of resources, and the need to mitigate each jurisdictional hazard.

Scope

Pre-Natural Disaster Mitigation Planning (PDM) is a statewide activity. The State of Utah has worked with all local jurisdictions by means of the seven regional Associations of Governments to accomplish this planning project. The Five County Association of Governments, which includes Beaver, Garfield, Iron, Kane, and Washington Counties, located in southwestern Utah, has completed a regionally based, multi-jurisdictional plan that addresses issues facing each individual county and their respective local communities. Natural hazards addressed are: Flooding; Wildfire; Landslide; Volcanism; Earthquake; Drought; Severe Weather; Problem Soils;

Insect Infestation; and Radon Gas. In much of the Five County planning area natural-hazards information is limited in nature and scope. Therefore, the information, data, and conclusions, which form the basis of the current PDM plan, are not comprehensive. However they do form a basis for future planning. This generalized regional plan does not answer all questions relative to natural-hazard impact in the Five County area, but rather represents a common point from which further study and analysis should begin.

Goals

To coordinate with each participating local government to develop a regional planning process meeting each plan component identified in the FEMA Region VIII Crosswalk document and any additional State planning expectation, both regionally and specifically, as needed, by gathering local input. And to also meet the need of reducing risk from natural hazards in Utah, through the implementation of and updating of regional plans.

Local Goals

These goals form the basis for the development of the Natural Hazards Plan and are shown from highest priority, at the top of the list, to those of lesser importance nearer the bottom.

- Promote activities designed for protection of life prior to a natural disaster event.
- Preventing loss of life and reducing the impact of damage where problems cannot be eliminated
- Emergency medical services and medical facilities
- Mobile resources
- Critical facilities
- Government continuity
- Protection of developed property, homes and businesses, industry, education opportunities and the cultural fabric of a community, by combining hazard loss reduction with the community's environmental, social and economic needs.
- Protection of natural resources and the environment, when considering mitigation measures.
- Promoting public awareness through education of community hazards and mitigation measures.
- Preserving and/or restoring natural features that provide mitigation such as floodplains.

Long Term Goals

- Eliminate or reduce the long-term risk to human life and property from identified natural and technologic hazards.
- Aid both the private and public sectors in understanding the risks they may be exposed to and finding mitigation strategies to reduce those risks.
- Avoid risk of exposure to identified hazards.
- Minimize the impacts of those risks when they can not be avoided
- Mitigate the impacts of damage as a result or identified hazards.
- Accomplish mitigation strategies in such away that negative environmental impacts are minimized.
- Provide a basis for funding of projects outlined as hazard mitigation strategies.
- Establish a regional platform to enable the community to take advantage of shared goals, resources, and the availability of outside resources

- Establish a framework and data base for the communities in the Five County Region to use to apply for available funding.

Objectives

The following objectives are meant to serve as a measure upon which individual hazard mitigation projects can be evaluated. These criteria become especially important when two or more projects are competing for limited resources.

- Identification of persons, agency or organization responsible for implementation.
- Projecting a time frame for implementation.
- Explanation of how the project will be financed including the conditions for financing and implementing as information is available.
- Identifying alternative measures, should financing not be available.
- Be consistent with, support, and help implement the goals and objectives or hazard mitigation plans already in place for surrounding counties.
- Be based on the Vulnerability Analysis.
- Have significant potential to reduce damages to public and/or private property and/or reduce the cost of, state, and federal recovery for future disasters.
- Be the most practical, cost-effective, and environmentally sound alternative after consideration of the options.
- Address a repetitive problem, or one that has the potential to have a major impact on an area, reducing the potential for loss of life, loss of essential services and personal.
- Prevent property damage to homes, businesses and critical facilities
- Prevent economic losses, hardship or human suffering.
- Meet applicable permit requirements.
- Not encourage development in hazardous areas.
- Contribute to both the short and long term solutions to the hazard vulnerability risk problem.
- Assure that the benefits of a particular mitigation measure are cost effective
- Have manageable maintenance and modification costs.
- When possible, be designed to accomplish multiple objectives including improvement of life-safety risk, damage reduction, restoration of essential services, protection or critical facilities, security or economic development, recovery, and environmental enhancement.
- Whenever possible, use existing resources, agencies and programs to implement the project.

Purpose & Process

To fulfill federal, state, and local hazard mitigation planning responsibilities; to promote pre disaster mitigation measures, short/long range strategies that minimize suffering, loss of life, and damage to property resulting from hazardous or potentially hazardous conditions to which citizens and institutions within the state are exposed; and to eliminate or minimize conditions which would have an undesirable impact on our citizens, the economy, environment, and the well-being of the state of Utah. This plan is an aid in enhancing city, county and state officials, agencies, and public awareness to the threat that hazards have on property and life and what can be done to help prevent or reduce the vulnerability and risk of each Utah jurisdiction. A partial listing of funding sources to accomplish natural hazard mitigation projects is included in this plan as Appendix H.

This regional/multi-jurisdictional plan evaluates the impacts, risks and vulnerabilities of natural hazards in a jurisdictional area affected by a disaster. The plan supports, provides assistance, identifies and describes mitigation projects for each hazard. The suggestive actions and plan implementation for local and tribal governments could reduce the impact of future disasters. Only through the coordinated partnership with emergency managers, political entities, public works officials, community planners and other dedicated individuals working to implement this program was it accomplished.

To develop the mitigation plan, The Utah DESHS, based on the Governor's Office of Planning and Budget, the Utah League of Cities and Towns, and the U.S. Department of Housing and Urban Development, chose to use the planning services of the Utah Associations of Governments.

Seven regional Associations of Government:

1. Bear River Association of Governments
2. Five County Association of Governments
3. Mountainland Association of Governments
4. Six County Association of Governments
5. Southeast Utah Association of Governments
6. Uintah Basin Association of Governments
7. Wasatch Front Regional Council

Cities and Towns within the Five County Area are:

Beaver County
Beaver City, Milford, Minersville

Garfield County
Antimony, Boulder, Cannonville, Hatch, Henrieville, Escalante, Panguitch, Tropic

Iron
Brian Head, Cedar City, Enoch, Paragonah, Parowan, Kanarraville

Kane County
Alton, Big Water, Glendale, Kanab, Orderville

Paiute Indian Tribe of Utah
PITU Council, Cedar Band, Indian Peaks Band, Shivwits Band

Washington County
Enterprise, Hildale, Hurricane, Ivins, LaVerkin, Leeds, New Harmony, Rockville, St. George, Santa Clara, Springdale, Toquerville, Virgin, Washington City

The Five County Plan will be included as part of the State-wide PDM Plan developed by the Utah Division of Emergency Services and Homeland Security. Future monitoring, evaluating, updating and implementing will take place as new incidents occur and or every three to five years and will be included in the local mitigation plans as well.

Federal Authority

Public Law 93-288 as amended, established the basis for federal hazard mitigation activity in 1974. A section of this Act requires the identification, evaluation, and mitigation of hazards as a prerequisite for state receipt of future disaster assistance outlays. Since 1974, many additional programs, regulations, and laws have expanded on the original legislation to establish hazard mitigation as a priority at all levels of government. When PL 93-288 was amended by the Stafford Act, several additional provisions were also added that provide for the availability of significant mitigation measures in the aftermath of Presidentially declared disasters. Civil Preparedness Guide 1-3, Chapter 6- Hazard Mitigation Assistance Programs places emphasis on hazard mitigation planning directed toward hazards with a high impact and threat potential.

President Clinton signed the Disaster Mitigation Act of 2000 into Law on October 30, 2000. Section 322, defines mitigation planning requirements for state, local, and tribal governments. Under Section 322 States are eligible for an increase in the Federal share of hazard mitigation (HMGP), if they submit for approval a mitigation plan, which is a summary of local and/or regional mitigation plans, that identifies natural hazards, risks, vulnerabilities, and describes actions to mitigate the hazards risks and vulnerabilities in that plan.

State Authority

The Governor's Emergency Operation Directive, The Robert I. Stafford Disaster Relief and Emergency Assistance Act, amendments to Public Law 93-288, as amended, Title *44,* CFR, Federal Emergency Management Agency Regulations, as amended, State Emergency Management Act of 1981, Utah Code *53-2, 63-5,* Disaster Response Recovery Act, *63-5A,* Executive Order of the Governor, Executive Order II, Emergency Interim Succession Act, 63-5B.

Five County Association of Governments Authority

The Associations of Governments have been duly constituted under the authority of Title XI, Chapter13, Utah Code Annotated, 1953, as amended (The Inter-local Cooperation Act) and pursuant to Section 3 of the Executive Order of the Governor of the State of Utah, dated May 27, 1970, with the authority to conduct planning studies and to provide services to its constituent jurisdictions.

> **The Five County Association of Governments (FCAOG), as presently constituted, was established in 1972. The intent of the local governments in establishing the organization is given in the Articles of Association:**
>
> ***"Therefore, we the representatives of local government of Beaver, Garfield, Iron, Kane, and Washington Counties in the State of Utah, hereby join together in a voluntary organization. . . for the purpose of meeting at regular intervals to discuss and study area wide problems of common interest and concern, and to develop policy and action recommendations for ratification and implementation by member governments in the area served by the region."***

Local Authority

Local governments play an essential role in implementing effective mitigation, both before and after disaster events. Each local government will review all damages, losses, and related impacts to determine the need or requirement for mitigation action and planning whenever seriously effected by a disaster, or when applying for state or federal recovery assistance. In each county the local executive responsible for carrying out plans and policies is the Board of Commissioners. Local governments must be prepared to participate in natural hazard mitigation as outlined in this document.

Environmental Considerations

Natural disasters are naturally occurring phenomena. They play an integral part in maintaining balance in our world. Meteorological, geological, and hydrological processes are what have shaped the geology of the Five County area and will continue to do so. These phenomena are only considered disasters when they affect humans and infrastructure. Modern engineering has made it possible in many cases to prevent damage from natural hazards. However the economic and environmental costs of such measures can be rather high. Tampering with natural systems may also create an imbalance in the natural environment. Effects of many of these imbalances long-term are still unknown. An open question remaining is whether it is better to live with an acceptable amount of risk to the human environment, respecting the natural processes where appropriate, than to attempt to develop mitigation measures at every chance. Nature provides its own mitigation measures that need to be identified, protected and/or strengthened. To ensure that our environment is not harmed through mitigation measures, all applicable city and county ordinances, state laws and federal regulations pertaining to the environment must be followed. All federally funded projects must comply with federal environmental laws. See Appendix A, for an explanation and details.

Planning Process

The process includes several steps beginning with identifying hazards that may occur; profiling hazard events that have occurred; making an inventory of community assets such as hospitals, fire stations, sheriff/police stations, schools, community centers, airports, bus stations, water tanks, sewer facilities, TV/radio facilities, power plants; and, estimating the effect of a hazard on community assets; See Appendix B, for details.

Risk Assessment Process

A risk assessment process involves estimating risks that a natural hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Sources

Source of data for the histories, profiles, and maps found inside this Hazard Mitigation Plan are taken from a collection of different sources. The majority of data for the Plan came from multiple departments within the State of Utah Government. Some Data came from professional journals and Federal Government websites (ex. USGS). Other data came from the five county area local governments' and citizen's input. For more information on the sources of data please see sources in Appendix F.

General Regional Profile

History

Early History

Southwestern Utah has a rich heritage, which dates back 10,000 to12,000 years. Early inhabitants were Desert Archaic hunter gatherers, who were supplanted by the Anasazi basket and pottery makers. These early people generally organized themselves into small bands of several families, groups that were limited in size because of their limited resources.

The Anasazi disappeared about 800 years ago and were replaced by Uto-Aztecan hunters, which were the forerunners of the Southern Paiute Indian Tribe, and related to the mighty Aztecs of Mexico. The quest for food kept them on the move; they lived principally on fish, birds, wild game, wild fruits, roots, and seeds.

In the early 1550s, Spanish conquerors led by Coronado first explored the Colorado River Plateau region. However, the Colorado Plateau and Grand Canyon prevented Spanish exploration into the area of present day Southwestern Utah for hundreds of years. The earliest documented evidence of exploration in this area was in 1776 when a party led by Father Escalante and Father Dominguez traveled through the region searching for a route to the California Missions. From the Milford region, the party turned southeast and was forced southward by the high mountains to the east. They traveled along the foot of a rough and rugged escarpment known as the Hurricane Fault. They continued south until a group of Parrusit Indians (related to the Paiutes) agreed to show them a route over the Hurricane Fault. Once the route was discovered by the Spaniards, it became a common route for Spanish traders and immigrants.

As more Spaniards entered the region, Native Americans experienced increasing disruption to their traditional way of life. Paiute encampments were raided for slaves and forced to mine gold. However, the small settlement of Spaniards that oversaw the mining was short-lived as the Native Americans revolted and killed the Spaniards. Although the route remained a well-used trading route known as the Old Spanish Trail, no permanent, non-Native American, settlements were attempted in the region until the arrival of Mormon Pioneers. The area remained Mexican territory until 1848, when the treaty of Guadalupe Hidalgo ceded much of the West to the United States. All of what is now Utah was designated as Indian Territory, and remained so until 1868.

European Settlement

Mormons first traveled through the region in 1847, when church leaders called a group of sixteen men to open up a route to California to get seeds, cuttings, and roots. This mounted company established a route along the Old Spanish Trail. Brigham Young sent Parley P. Pratt with 50 young men to the region in 1849 to look for sites for future towns. Upon finding friendly Indians who engaged in primitive agriculture, as well as discovering iron in the region near present day Cedar City, Pratt's group hurried back to Salt Lake City with a report of many potential settlement sites. The first outposts were established in New Harmony and Santa Clara for the purposes of setting up an Indian mission. Other outposts were soon established along the streams and rivers of the region.

Iron County was established in 1850. George A. Smith was appointed as the county's first Chief Justice. His job was to settle the area for the purpose of developing the iron ore deposits. Both Parowan and Cedar City were established in 1851. During the first year of development, 2,500 pounds of iron were produced, the first iron refined west of the

Mississippi River. To facilitate the processing of iron in the two towns, skilled tradesmen were brought in from the Mormon European Missions.

The first settlers in Beaver County came from Parowan in 1856. The county's first town was laid out in the spring of 1858, and was named for the many beaver dams found on the river there. In 1852, lead was discovered in Beaver County, which led to the establishment of the town of Minersville in 1859.

Brigham Young called 300 families to establish the new community of St. George in 1861. The town was named after his counselor, George A. Smith, because he was nominally in charge of the southern Utah colonies. The Mormon prophet dispatched the group, which included 26 Swiss immigrant families, to grow cotton. The first experimental crop was planted in the Santa Clara Valley. The soil and climate were well suited for growing cotton, and two years later the only Dixie-style cotton mill in the northern states was established. The cotton boom lasted until the close of the Civil War.

For years saints were called or directed to the Washington County region to settle. In 1863, St. George was designated as the county seat for Washington County. Young, himself, eventually established a winter home in St. George, where he later initiated and oversaw the completion of the first Mormon temple in the West in 1877.

As Washington County grew and prospered, people began moving into the Kanab region. In 1864, Kane County's boundaries were set by the Territorial Legislature. The communities of Kanab and Orderville were established in 1870 and 1873 respectively.

Back north, silver was discovered in the San Francisco Mountains west of the Beaver area, which gave impetus to one of the biggest "rushes" of Western history. Because of the mining industry in this region, the telegraph was brought south to Frisco, the railroad was brought to southern Utah, and the town of Milford was established in 1880. Beaver County was created in 1886.

During this time, Garfield County was formed from parts of Iron and Kane counties in 1882. Mormon colonists from Parowan and Beaver had already settled Panguitch. Exploration parties moved east into what they called "Potato Valley" and founded Escalante. The town was named for Father Escalante at the suggestion of a U.S. Government survey party lead by John Wesley Powell, who encountered the Mormon explorers at the future town site. Communities in Bryce Valley were subsequently settled in the 1880s and 1890s, mainly by people moving up the Paria River after floods downstream washed away the small amounts of arable lands.

Much of the Mormon settlement in the region was accomplished without legal title to lands. Some lands were formally purchased from American Indians in the area, but much more was simply settled without title. After 1868, the lands became subject to U.S. land tenure laws, including the Homestead Act. Federal and state land offices were established and the titles to lands settled before 1868 began to be perfected. The climate and topography of the region limited the amount of land that could be "proven up," thus creating the large blocks of federal lands found in the region today.

As settlement increased throughout this region, Native Americans' traditional homelands were eventually taken over. The Native Americans were subject to unfortunate policies of the federal government that resulted in termination of tribal recognition. Late in the 19th century, the Paiute bands in southern Utah coalesced into five bands: the Shivwits, Indian Peaks, Cedar, Kanosh, and Koosharem bands. Reservations were established between 1903 and 1929.

The Twentieth Century

At the turn of the Century, the Mormon settlements and regions of southwestern Utah experienced moderate growth. The area was heavily dependent upon the agriculture and mining sectors of the economy. Most communities experienced decline during the Great Depression and into the mid-1960s. The construction of Interstate 15 through the region promoted increased interest in the area and precipitated the resurgence of Cedar City and St. George. The area also became increasingly attractive to retirees from the Midwest and Pacific Northwest.

Around this time, an act of Congress restored the federal trust relationship to the five bands of Paiutes, which constitutes the Paiutes Indian Tribe of Utah. By 1983, the majority of tribal members had access to adequate housing and health care, although chronic health problems, low educational attainment, underemployment, and alcoholism persisted.

Today Southwestern Utah is one of the fastest growing areas of the state. The I-15 corridor communities are experiencing rapid population and employment growth, while communities off the I-15 corridor rely on a burgeoning tourist and trade economy, still heavily reliant upon natural resource-based employment.

As we enter the twenty-first century, it is likely that the rapid growth of this region will continue. Some residents fear for the future since rapid growth has already had some negative impacts on the region, such as an increasing crime rate, increasing housing prices, the surfacing of environmental problems, and a loss of cultural heritage and regional identity. However, others are optimistic about the growth, citing low unemployment figures and increased amenities.

Area Background

The five counties that make up the southwestern area of Utah, Beaver, Garfield, Iron, Kane and Washington, are unique to the state and country. These counties have unique characteristics including geographical, geological, historical, and demographic that define the regions environment.

Jurisdictions

Southwestern Utah conjures up many images to the minds of those who live in or visit the region including red rock cliffs and mesas, pristine wilderness and desert, scenic national parks and monuments, hiking, camping, and other outdoor recreation. The fact is that few people associate this region with its growing population and economic base. Yet, over 140,000 people reside here in this region, a majority of which resides in 36 different cities and towns (see Table 1).

Table 1. Jurisdictions of the Five County District

Beaver County	Garfield County	Iron County	Kane County	Washington County
Beaver City	Antimony	Brian Head	Alton	Enterprise
Milford	Boulder	Cedar City	Big Water	Hildale
Minersville	Cannonville	Enoch	Glendale	Hurricane
	Escalante	Kanarraville	Kanab	Ivins
	Hatch	Paragonah	Orderville	LaVerkin
	Henrieville	Parowan		Leeds
	Panguitch			New Harmony
	Tropic		**Paiute Tribe**	Rockville
			Cedar Band	Saint George
			Indian Peaks Band	Santa Clara
			Shivwits Band	Springdale
				Toquerville
				Virgin
				Washington City

Geography and Environment

The geography and environment of a region play important roles in community planning. As towns, cities, and counties develop, planners must consider the "lay of the land" and the many environmental issues that come with it. It is now more important than ever that we understand the land on which we develop, and its accompanying limitations and potential problems. The Five County Area is no exception, and has many unique issues pertaining to its distinct geography and environment.

Physical Description

The Five County District is located at the southwest corner of Utah, near the heart of the Intermountain West. The five counties are contained in two major physiographic provinces. Most of Beaver, Iron, and Washington County lay within the Basin and Range province, which generally consists of north-south trending mountain ranges separated by broad arid valleys with interior drainage, and vegetated with sagebrush and other plants of the Great Basin. Garfield and Kane counties are located in the Colorado Plateau, which consists of uplifted sedimentary rock strata vegetated with desert sage scrub.

On a more localized scale, the area is also speckled with a variety of topographic features. Some of this area has experienced a great amount of volcanic activity, which is evident in extinct volcanoes, mountains, great lava fields, and mesas. Geologic forces have uplifted huge portions of the land, and have created great rifts in others. Of particular notoriety are the erosional features of the area including the great canyons and cliffs carved by water and wind that make up the national and state parks, such as Zion’s, Bryce, and Snow Canyon.

The soil in this area consists mostly of aridisols, an iron-rich desert soil that can be quite productive if cultivated. Aridisols are used mainly for range, wildlife, and recreation. Because of the dry climate in which they are found, they are not used for agricultural production unless irrigation water is available. Native to the valleys throughout most the region is a variety of grasses, junipers, and pinion pines, while xerophytes and desert scrub are native to the lower elevations. Farming has produced a diversity of crops, including barley, alfalfa, hay, and cotton (which earned the southern region the name of "Dixie"). Much of the region has also been prime land for ranching cows, sheep, and horses.

Climate

Because of its general location, the Five County District is mostly semi-arid. As moist air moves in from the Pacific Ocean, it is forced to rise over the Sierra Nevada Mountain Range, which causes it to cool and drop its precipitation, leaving very little moisture left for the region East of the Sierra Nevadas. While all of the Intermountain West is generally dry due to this phenomenon, the aridity in the Five County District is accentuated by its lower latitude, which makes it warmer than most regions to the north. Much of this area is characterized by lower elevation, which also increases the mean annual temperature.

For example, St. George's warm climate, which is unique to the state of Utah, can be attributed to the fact that it has the lowest elevation of any Utah city and lies at the very southern end of the state. In fact, St. George has the highest mean annual temperatures in Utah, averaging 61-62 degrees Fahrenheit. It also boasts the highest maximum temperature ever recorded in Utah, which was 117 degrees Fahrenheit, observed on July 5, 1985.

Though scholars classify most of the region as "desert," only the areas with lower elevations are considered "hot" deserts, or regions where the winters average above 32 degrees Fahrenheit. This would include most of Washington County. This region usually does not have snow in the winter, and has extremely warm summers. The rest of the region, which consists of higher elevations, is considered to be a "cool" desert, with snowy winters and warm summers. Some exceptions exist over the highest elevations, mountainous regions such as Brian Head, which are classified as "undifferentiated highlands" since they experience cooler temperatures and higher humidity than the rest of the area. These regions generally have very cold, snowy winters and cool summers.

Like the rest of the Intermountain West, during the winter, most precipitation results from the passage of mid-latitude cyclones, while in the summer, convection from localized heating can trigger isolated thunderstorms. Without the moderating effects of the ocean, and therefore, cloud cover from water vapor in the air, this region experiences great daily and yearly fluctuations in temperature.

The nature of the climate in this region leaves it susceptible to a few hazardous weather recurrences. Although most of the country is subject to flash floods, they are particularly damaging in this region since the soil is dry, somewhat un-vegetated, and easily eroded. Threats to human lives and damage to property are not only a result of rapidly rising waters, but of catastrophic mud slides as well. This area is also subject to tornadoes, although they are a rare occurrence. More common in the warmer regions are dust devils, which are rarely severe enough to damage property. The higher elevations always have the potential for blizzards, cold spells, and avalanches in the winter. The entire region is susceptible to fires resulting from lighting strikes in the spring and summer, which is actually a frequent occurrence.

Demographics and Population

The tables in this section provide a sense of the population characteristics in the Five County District (see Tables 2 & 3).

Migration Patterns

Any long time resident of the Five County District could tell you that this region has changed in the last several years. The 90s brought a population boom to most of the area, which was obvious by the prospering housing and real estate market. Since the Five County District is generally rural and people generally migrate to urban areas, the migration boom came as a surprise to many residents. However, the boom was actually part of a much larger phenomenon taking place all over the Intermountain West. In the past two decades, Western rural towns have become increasingly attractive to urban dwellers all over the country, especially Californians. Tired of city traffic, pollution, crime, an economic recession in California, people moved to the rural West to find a simpler, and slower-paced life. Southwestern Utah is no exception.

Based on the net migration figures between the years 1987 to 1997, all of the counties have experienced positive net migration since 1992, except Garfield County, which had negative migration as recently as 1994. For all of the counties, positive migration peaked in 1994 or 1995 except Garfield, which peaked in 1991. Washington County was the only county to experience positive net migration every year since 1987. Iron County has experienced positive net migration since 1990, and Beaver and Kane had similar migration patterns, both experiencing positive net migration since the early 1990s. Garfield had intermittent periods of positive migration and negative migration until 1995, and has had positive net migration since 1995.

Table 2. Utah net migration for fiscal years 1987-97 by county

	Beaver	Garfield	Iron	Kane	Washington
1987	-91	-43	-298	-18	1873
1988	-130	-73	-487	62	1236
1989	-27	-3	-3	-68	1620
1990	-25	-82	188	-153	1324
1991	-25	118	288	47	2224
1992	56	-14	563	53	2534
1993	76	73	1080	57	3116
1994	118	-39	1017	222	4024
1995	195	68	1236	163	4382
1996	158	58	678	42	3456
1997	80	90	829	43	2507

Source: Utah Governor's Office of Planning and Budget.

Profile of Populations

As the Five County Region grows, it is becoming more racially and ethnically diverse. The 2000 U.S. Census shows the current population, identified by race and ethnicity. (See Table 3).

Table 3 Five County Population by County & Race/Ethnicity

	Beaver	Garfield	Iron	Kane	Washington	Region
White	5,599	4,496	31,416	5,804	84,543	131,858
Black or African American	16	8	119	2	186	331
American Indian or Alaskan Native	54	87	737	94	1,328	2,300
Asian	37	19	251	13	405	725
Native Hawaiian or Other Pacific Islander	5	2	92	3	384	486
Some other race	188	53	600	45	2,020	2,906
Two or more races	106	70	564	85	1,488	2,313
Hispanic or Latino (of any race)	333	136	1,383	140	4,727	6,719

Source: 2000 U.S. Census Bureau, Census 2000

Age is another important indicator of population characteristics, since the needs and desires of a population will vary according to its age structure. For example, a population with a high percentage of retirees will require more recreation and medical facilities, while a population with a high percentage of children will require more schools, parks, and infrastructure geared for the family. The Governor's Office of Planning and Budget made predictions of the age and sex structure for all counties in the state. Although the predictions for age structure are available for the years 1990 to 2020 for each county, included in this document are just the 1998 figures by county, However, the totals for the Five County Region are included from 1990 to 2020. More information on predictions by county can be obtained from the Governor's Office previously mentioned, or from the Department of Workforce Services in St. George.

The selected results showed that all five counties have similar age ratios, with approximately 9 percent of the population five years and under, 22 percent between 5 and 17, 20 percent between 18 and 29, 14 percent between 30 and 39, 24 percent between 40 and 64, and 15 percent 65 years or older. The two exceptions are Iron County, which has higher percentages in the younger age groups indicating a younger population, and Washington County, with lower percentages in the youngest age groups and higher percentages in the 65 and older category, indicating an older population. See Appendix C for detailed Census data.

Economic Factors

Although the five counties of the Southwest District share common geographic boundaries, the economic make-up of the individual counties varies considerably. Information taken from the Utah Department of Workforce Services quarterly newsletters (first half, 2001), shows a wide variety of economic conditions. The three counties that share access to Interstate 15 (Beaver, Iron and Washington) also exhibit more diverse economic bases and more resilient economies. The two more remote counties (Garfield and Kane) are dependent upon tourism as their primary economic base. The nation-wide economic slowdown that began in early 2001 is reflected in recent district statistics. The events of September 11, 2001 are not yet documented in official statistics, but anecdotal information confirms a dramatic slowdown in travel-related economic activity.

The following information on each county is an abridgment of county newsletters for the first half of 2001, published by the Utah Department of Workforce Services in December 2001. Special thanks are given to Lecia Parks Langston, Western Region Economist, who authored the original text.

Beaver County
The Beaver County economy didn't have a particularly auspicious beginning to 2001. However, after a string of employment losses, job growth crept over the line into positive territory. All in all, the county's economic indicators are not presenting a clear economic picture. But, there does seem to be some light at the end of the tunnel as second quarter figures were, in general, better than first quarter indicators. Despite a two-quarter drop in employment, Beaver County's unemployment rate remained relatively low—3.6 percent for both the first and second quarters of 2001. In addition, both rates were down from figures from the same quarters Beaver County in 2000. During the first six months of 2001 the Beaver County average unemployment rate equaled the Utah figure and registered below the national rate. Small counties often exhibit roller coaster-like changes in job growth rates. Beaver County is no exception. Most of the drag on jobs comes out of the services industry. Most other industries experienced increasing rather than decreasing payrolls

Garfield County
Garfield County's slumping economy didn't see recovery in the first half of 2001. The county has been losing employment for almost a year. Not surprisingly, this contraction has taken its toll on the unemployment rate that just kept edging up. The picture might not get much brighter by year-end. Garfield County is heavily dependent on tourism to support its economy. The events of September 11 will undoubtedly affect the county's economy during the last two quarters of the year. The unemployment rate is never Garfield County's strong suit. Seasonality creates a situation where seasonally adjusted unemployment rates always seem to be extraordinarily high. First quarter's 8.2 percent jobless rate was nothing out of the ordinary. However, add another percentage point to that number and you have second quarter's figure—the highest in more than two years. Unemployment in Garfield County during the first half of 2001 was double the national rate.

Garfield County is unusual in that the largest industry sales producer is services. Typically, retail trade generates the largest pool of sales revenue. So, it isn't surprising to discover that Garfield County's total gross taxable sales performance follows the lead of services. Most industries decreased their expenditures during both quarters. The Garfield County economy has certainly stumbled during the last several quarters. Moreover, the county will no doubt suffer at least some aftereffects of the slow down in travel as many visitors come from overseas. In addition, the county may also feel the pains of a decline in non-flying tourism if the national recession makes a deep dent in individuals travel plan

Iron County
Months before September 11 changed the landscape of the U.S. economy, Iron County had started to show signs of a downturn. Joblessness was creeping up, construction activity had started to wane and (despite several new retail establishments) sales were less than robust. However, it was the decline in the number of non-farm jobs during the second quarter of

2001 that provided the clinching signal of a less than robust economy. Iron County is particularly vulnerable to economic downturns. Because of incentives, economic development, and the railroad, Iron County has a large manufacturing sector for a county its size. And, manufacturing feels the brunt of a downturn more heavily than a more service-oriented economy. The job losses aren't that large, and a number of construction projects are in the offing. But, expect the county to see signs of further struggle.

Iron County's unemployment rate has been increasing for the past year. However, in historical terms, even the 4.2 percent rate registered in the second quarter of 2001 truly is low. Also, while the county's jobless rate measures higher than the Utah six-month average of 3.6 percent, it remains slightly below the U.S. 4.3-percent rate.

Total construction values were up 19 percent when the first six months of 2000 and 2001 are compared. New nonresidential permitting was the major bright spot in an otherwise dismal construction picture during the first quarter of 2001. Nonresidential construction values totaled $12.6 million during the first half of 2001— an increase of 160 percent over the first half of 2000. Retail sales took a slight tumble during the first quarter of 2001. In comparison to the first quarter of 2000, sales in the retail trade industry were down about 1 percentage point.

By the June of 2001, Iron County's economy was beginning to sputter. Private sector job growth dropped noticeably and unemployment crept past the 4-percent mark. Construction permitting activity also began to ebb, and sales were mediocre at best. And, keep in mind that this happened before September 11.

Kane County

Kane County's indicators for the first half of 2001 split down the middle. Labor market measures showed expansion—jobs grew nicely and unemployment decreased. On the other side of the coin, construction activity and sales were both down on a year-over basis. Kane County is not an island and will undoubtedly feel some recessionary pressures trickle down from the national level.

Unemployment in Kane County followed the path of the bouncing ball. First quarter's jobless rate registered 4.6 percent. But, by second quarter, unemployment had dropped to only 3.2 percent. This sort of behavior is not uncommon for smaller counties where a small numeric change can result in a large percent change. This has proved the pattern over the past several years. Amusement/recreation services created most of these new positions with a little help from agricultural services and hotels/motels. In other words, most of the new positions created in Kane County during the first six months of the year are related to tourism.

Kane County construction activity took a breather during the first two quarters of 2001. Both quarters showed declining permitted values when compared with 2000. In fact, the value of authorized construction fell in virtually every category during the first six months of the year.

Like many of its compatriots in the Beehive State, Kane County's year-over change in gross taxable sales took a negative bent during the first half of 2001. Moreover, the declines proved fairly substantial. Based on a year-to-year comparison, first quarter sales dropped by almost 10 percent; second quarter sales declined by 7 percent. If you followed the trend throughout 2000, this shouldn't come as a huge surprise. The rate of sales growth had been shrinking since the first quarter of 2000 when the growth rate peaked. This drop in sales revenues appeared decidedly broad-based.

Although Kane County's labor market indicators look good right now, most of the job growth is focused in just one area—recreation and lodging. Several industries showed declining employment no doubt in response to an already faltering U.S. economy. With construction activity down and with falling sales, the county is particularly vulnerable to the country's downward economic trend

Washington County

During the first half of 2001, unemployment remained moderate, jobs were booming, and sales were up nicely. Construction activity dropped somewhat. However, construction is the most sensitive (and erratic) economic indicator available on the county level. Although the county did experience a little 3.7-percent blip in the unemployment rate in the first quarter of 2001, joblessness still remained very low. In fact, by the second quarter of 2001, Washington County's unemployment rate had edged back down to 3.4 percent. Job growth in the county has been so strong in recent quarters that one would have expected the labor force to have increased even more. Washington County's rate for the first half of 2001 (3.5 percent) falls below the comparable figure for Utah (3.6 percent) and the U.S. (4.3 percent.).

For the last year and a half, non-farm job growth rates in Washington County have proved decidedly monotonous. They have just been bouncing around in a narrow 5.5- percent to 6-percent range. Compared to the national and state slowdown (even before September 11), Washington County is showing remarkable economic expansion. Almost universally, services subcategories all experienced strong expansion. Retail trade industries experienced almost universal growth. General merchandise stores (like WalMart), showed some of the fastest expansion. Perhaps the biggest industrial surprise of the first half of 2001 was the growth in manufacturing employment. Stone/clay/glass products, fabricated metal, and electronic equipment all showed noticeable employment improvements.

Construction permitting in Washington County ebbed somewhat during the first six months of 2001. Yet, despite a 14 percent year-over decline in total authorized values, construction activity remains very strong. New construction activity was down decidedly during the first quarter but returned refreshed during the second quarter. Still, it wasn't quite enough to keep the overall growth rate positive. Moreover, every category showed a decline in values. While not much changed in residential building, new nonresidential construction values dropped by almost 30 percent. Keep in mind that this set of permits included only one "big box" retailer. Moreover, the new IHC project has yet to be reported.

Growth in Washington County's gross taxable sales figures just continued on its merry way during the first half of 2001. With all the new retail trade business establishing a presence in the county, this shouldn't come as a great shock. Residents are now able to buy many things in the county that they often shopped for out of the county and more particularly, out of the state. When the first quarters of 2000 and 2001 are compared, sales are up 8 percent. Second quarter's numbers proved even better—an increase of almost 12 percent. This expansion is proving to be quite broad-based. Very few industrial subcategories are showing any kind of decreased revenues at all. Most industries in the business investment category displayed robust gains during both quarters. Most increased expenditures in the double-digit range.

Will Washington County be affected by the national downturn? Probably. However, given the strong nature of the current economy, the “for sure” projects, employment in the offing, and predictions of a short U.S. recession, the effect is most likely going to be more like a tap on the cheek than a body blow.

Transportation and Commuting Patterns

The Southwestern portion of Utah is traversed by: an Interstate Freeway (I-15); a U.S. Highway (Highway 89); and, several State Highways (SR9, SR12, SR14, SR18, SR20, SR21, SR22, SR56, SR59, SR95, SR130, SR143, SR153, SR257, and SR276). Highway 12 has been designated as both a state scenic byway and a national scenic highway. These roadways bring visitors in and through our area and provide access for residents to the workplace. The United States Census , Census 2000 lists resident responses to their workplace by county, state and country.

Table 4 illustrates the information provided by residents to the Census Bureau.

Table 4 Commuting Patterns by County

Workplace of Beaver Residents by County, State, and Country

Workplace	Number of Residents	
Within County		2,258
In neighboring county within the SW area		126
In state North and East of the SW Area		56
Counties in Nevada and Arizona		12
Out-of-State		8
Out-of-Country		

Workplace of Garfield Residents by County, State, and Country

Workplace	Number of Residents	
Within County		1,776
In neighboring county within the SW area		61
In state North and East of the SW Area		118
Counties in Nevada and Arizona		13
Out-of-State		15
Out-of-Country		

Workplace of Iron Residents by County, State, and Country

Workplace	Number of Residents	
Within County		13,882
In neighboring county within the SW area		915
In state North and East of the SW Area		157
Counties in Nevada and Arizona		130
Out-of-State		141
Out-of-Country		

Workplace of Kane Residents by County, State, and Country

Workplace	Number of Residents	
Within County		1,867
In neighboring county within the SW area		120
In state North and East of the SW Area		133
Counties in Nevada and Arizona		460
Out-of-State		41
Out-of-Country		

Workplace of Washington Residents by County, State, and Country

Workplace	**Number of Residents**	
Within County		32,708
In neighboring county within the SW area		489
In state North and East of the SW Area		395
Counties in Nevada and Arizona		1,088
Out-of-State		257
Out-of-Country		30

BECGS

Some communities in our region participate in the BCEGS (Building Code Effectiveness grading schedule) compiled by ISO (International Organization for Standardization) See Appendix D for details.

The BCEGS assesses the building codes in effect in a particular community and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards.

The concept is simple: municipalities with well-enforced, up-to-date codes should demonstrate better loss experience, and insurance rates can reflect that. The prospect of lessening catastrophe-related damage and ultimately lowering insurance costs provides an incentive for communities to enforce their building codes rigorously especially as they relate to windstorm and earthquake damage.

The anticipated upshot: safer buildings, less damage, and lower insured losses from catastrophes.

The BCEGS program assigns each municipality a BCEGS grade of 1 (exemplary commitment to building-code enforcement) to 10. ISO develops advisory rating credits that apply to ranges of BCEGS classifications (1-3, 4-7, 8-9, 10). ISO gives insurers BCEGS classifications, BCEGS advisory credits, and related underwriting information.

One score in the table is for residential the other for commercial. If a community is not listed it does not participate in the ISO BCEGS rating system. This rating system serves as an independent review of building codes, ordinances and enforcement.

NFIP

In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer funded disaster relief for flood victims and the increasing amount of damage caused by floods.

The Mitigation Division a component of the Federal Emergency Management Agency (FEMA) manages the NFIP, and oversees the floodplain management and mapping components of the program.

Communities in the Five County Area are part of nearly 20,000 communities across the United States and its territories that participate in the NFIP (See Appendix E) by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and businesses in these communities.

Flood damage is reduced by nearly $1 billion a year through partnerships with communities, the insurance industry, and the lending industry. Further, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance. And, every $3 paid in flood insurance claims saves $1 in disaster assistance payments.

Army Corps of Engineers Study

The U.S. Army Corps of Engineers Sacramento District completed a flood hazard identification study through a contract with the seven associations of governments in Utah. Funding was provided under the USACE Planning Assistance to States Program (Section 22). The purpose of the study was to aid in detailing natural hazards associated with fluvial processes for entities within each AOG region currently unmapped as part of the National Flood Insurance Program or mapped as D Zone areas. This study, entitled “Flood Hazard Identification Study, Five County Association of Governments” dated August 18, 2003, was provided to the planning team. A copy of this study is on file at the offices of the Five County Association of Governments.

Hazard Identification and Justification for Inclusion in Plan

The Five County Association identified ten hazards that are addressed in this multi-jurisdictional plan. These hazards were identified through a process that included, but was not limited to responses in the FCAOG Natural Hazard Assessment Questionnaire, completed by local officials; input from the Regional Team and Emergency Managers; citizen comments from the Public Forums; data and correspondence with appropriate agencies; review of data, maps and documents available on the internet; and use of the FCAOG Geographic Information System (FCAOG GIS).

Table 4a: Hazard Identification & Justification for Inclusion in Plan		
Hazard	**How Identified (Primary Sources)**	**Why Hazard is Identified in Plan**
Wildfire	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums -Utah Forestry, Fire and State Lands - Internet searches	Southwestern Utah has experienced numerous wildfires over several years. Among the most notable were the Apex Fire west of St. George in 2003 and the Sequoia southwest of Cedar City in 2002. There are many areas in southwestern Utah with the potential for wildfire. Even with additional management efforts for forest sustainability, the likelihood of additional naturally and man-caused wildfires in the region remains.
Landslide	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Geology Publications - Internet searches	Landslides are one of the most common geologic hazards in Utah and annually cause significant economic losses. Approximately 45 percent of the state of Utah is mountain, hill, and steep-valley terrain conducive to landslides. Also, some geologic formations in Utah are particularly prone to develop landslides. Southwestern Utah is the location of many active and historic landslides. The Springdale landslide, triggered by the September 2, 1992 earthquake 10 miles east of St. George was the most dramatic result of ground shaking. This slide destroyed two water tanks, several storage buildings, three homes in a subdivision, blocked State Route 9, and ruptured utility lines. Another landslide of note, the Cedar Canyon landslide of approximately 1.5 million cubic yards, occurred about 7 miles east of Cedar City in the early morning hours of March 27, 1989. Many other smaller landslides have occurred and given the right conditions can occur in many locations.
Earthquake	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Geology Publications - Internet searches	Earthquakes have occurred in southwestern Utah in the past and are historically problematic. There are known earthquake faults located throughout the area. The most notable earthquake in recent history was on September 2, 1992, a magnitude 5.8 earthquake that occurred in southwestern Utah at a location about 10 miles east of St. George. Earthquakes are unpredictable and can be costly and deadly.
Problem Soils	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Geology Publications - Internet searches	There is a great variety of geology in the five southwestern counties. There are known soil and rock related engineering geologic problems in a variety of geologic settings. Some of these conditions are localized and some are widespread hazards. This hazard is considered in the plan as it was determined that there are six types of problem soil and rock are present in southwestern Utah.

Table 4a: Hazard Identification & Justification for Inclusion in Plan		
Hazard	**How Identified (Primary Sources)**	**Why Hazard is Identified in Plan**
Flood **(Including inundation from dam failure)**	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Flood Insurance Rate Maps - U. S. Army Corps of Engineers - Review of Local Emergency Operations Plans - Input from City and County Emergency Operations Managers - Utah Division of Water Rights, Dam Safety Section - Inundation Maps - Internet searches	Flooding is a common geologic hazard in Utah and annually cause significant economic losses. Summer cloudbursts and rapid snowmelt have flooded many Utah communities. Cloudburst storms in Southwestern Utah are historically problematic. As an example, there was property damage from a flood in the town of Tropic on August 24, 2003, when 30 structures sustained damage, the majority of them residential homes. In addition, there have been several deaths, since 1952, in southwestern Utah, from flooding. There are numerous dams and water impediments in southwestern Utah. While the risk is relatively low the threat is high should a failure occur. The most notable dam failure in southwestern Utah was the failure of the earthened dam at Quail Creek Reservoir. Water released by this dam failure entered the Virgin River and destroyed a bridge on Utah 9 in Hurricane. Flood waters swept through a farm many farm animals Traffic into Zion National Park had to be diverted onto Utah 17. Interstate 15 through the Virgin River Gorge, south of St. George, was closed due to fear of damage to bridges. Approximately 1,500 residents of St. George fled to high ground. About 30 homes in Bloomington area of St. George sustained serious water damage. Estimates placed the total damage at $11,959,732.
Drought	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Geology Publications - Internet searches	Droughts generally affect most or all of the state of Utah. Southern Utah, in particular the Virgin River drainage basin, began experiencing drought conditions during the winter of 1998-99. By 2000, drought conditions were evident throughout all of Utah. The current drought (1999-2004) is comparable in length and magnitude to previous droughts. Because of population growth and increased demand for water in Utah, the general effect is more severe. It is likely that the cyclical nature of drought followed by periods of normal or above normal precipitation will occur in the future.
Severe Weather	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Internet searches	Severe weather events occur at times throughout southwestern Utah. This region is not immune from even the rare occurrence of tornadoes. With the exception of Kane County there have been 12 reported tornadoes in the other four counties. Many more instances of severe lightning, windstorms and cloudburst storms have affected the region. There have been 4 deaths and 10 injuries reported as lightning caused in the five southwestern Utah counties.
Volcanism	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Geology Publications - Internet searches	There has been caldera-type eruptive volcanic activity in southwestern Utah dated as occurring in the early Cenozoic period. As the geologic conditions that created those types of eruptions has long since disappeared there is zero chance of their repetition. The current hazard relating to volcanic activity is strictly limited to localized, small, cinder cone basaltic eruptions. According to geologists, the hazard is real, but extremely infrequent and would be limited to a relatively small area. For this reason this hazard is not considered with the same emphasis as other natural hazards that are much more likely to reoccur and or affect a larger area.

Table 4a: Hazard Identification & Justification for Inclusion in Plan		
Hazard	**How Identified (Primary Sources)**	**Why Hazard is Identified in Plan**
Radon Gas	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Geology Publications - Internet searches	The Utah Geologic Survey began identifying and studying areas of Utah with a high potential for radon as part of the Toxic Substances Control Act and the Indoor Radon Abatement Act of 1988. UGS studies showed radon-gas hazard potential in the Beaver Basin area is one of the highest in the state. The Basin was identified by the Utah Department of Environmental Quality as an area of concern after tests showed indoor radon levels were the highest recorded in the state. The basin encompasses about 160 square miles in eastern Beaver County in southwestern Utah. Additional radon gas hazard studies are necessary throughout the region to organize and prioritize testing in existing buildings and to indicate where radon-resistant construction should be considered in new buildings.
Insect Infestation	- Natural Hazards Assessment Questionnaire to officials - Citizen Comments from Public Forums - Input from City and County Emergency Operations Managers - Internet searches - Utah State University Agricultural Extension	Insect Infestation has the potential to significantly affect one of the sectors of the region's economy, agriculture. Northern Beaver County and portions of Iron County are experiencing the effects of insect infestation that coincidently follows in many cases the pattern of severe drought. Infestations are currently taking a severe toll on some of the forests in southwestern Utah. Secondary effects of these forest infestations are the increased risk of devastating forest fires. Additionally, effects of insect infestation can range from simply a major inconvenience to having actual health and safety implications.

Hazard Descriptions

What is a Wildfire?

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring, and non-native species of grasses, brush, and trees fuel wildfires.

A **wildland fire** is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. An **Urban-Wildand Interface fire** is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Additionally, areas anywhere that have experienced prolonged droughts, or are excessively dry, are also at risk of wildfires.

People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires.

Wildfire behavior is based on three primary factors:

- Fuel
- Topography
- Weather

The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor, in that it expresses the pattern of vegetative growth and open areas.

Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels.

Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity and wind (both short and long term) affect the severity and duration of wildfires.

What is a Landslide?

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors:

- erosion by rivers, glaciers, or ocean waves create oversteepened slopes
- rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- earthquakes create stresses that make weak slopes fail
- earthquakes of magnitude 4.0 and greater have been known to trigger landslides

- volcanic eruptions produce loose ash deposits, heavy rain, and debris flows
- excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from man-made structures may stress weak slopes to failure and other structures

Slope material that become saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, thus blocking bridges and tributaries causing flooding along its path.

Where do landslides occur?

Landslides occur in every state and U.S. territory. The Appalachian Mountains, the Rocky Mountains and the Pacific Coastal Ranges and some parts of Alaska and Hawaii have severe landslide problems. Any area composed of very weak or fractured materials resting on a steep slope can and will likely experience landslides.

Although the physical cause of many landslides cannot be removed, geologic investigations, good engineering practices, and effective enforcement of land-use management regulations can reduce landslide hazards.

The United States Geological Survey produces landslide susceptibility maps for many areas in the United States. In every state, USGS scientists monitor streamflow, noting changes in sediment load carried by rivers and streams that may result from landslides. Hydrologists with expertise in debris and mud flows are studying these hazards in volcanic regions.

Types of Landslides

Fast-moving Debris Flows

Debris flows start on steep slopes—slopes steep enough to make walking difficult. Once started, however, debris flows can even travel over gently sloping ground. The most hazardous areas are canyon bottoms, stream channels, areas near the outlets of canyons, and slopes excavated for buildings and roads. Debris flows (also referred to as mudslides, mudflows, or debris avalanches) generally occur during intense rainfall on water-saturated soil. They usually start on steep hillsides as soil slumps or slides that liquefy and accelerate to speeds as great as 35 miles per hour. Multiple debris flows that start high in canyons commonly funnel into channels. There, they merge, gain volume, and travel long distances from their source. Debris flows commonly begin in swales (depressions at the top of small gullies) on steep slopes, making areas down slope from swales particularly hazardous. Road cuts and other altered or excavated areas of slopes are particularly susceptible to debris flows. Debris flows and other landslides onto roadways are common during rainstorms, and often occur during milder rainfall conditions than those needed for debris flows on natural slopes. Areas where surface runoff is channeled, such as along roadways and below

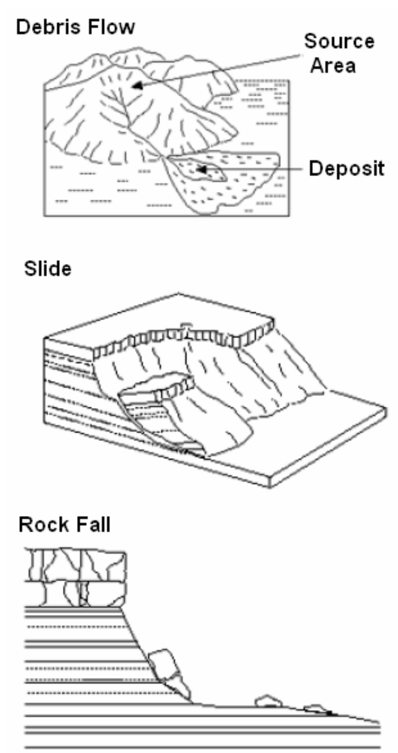


Figure 1

culverts, are common sites of debris flows and other landslides.

Slow-moving Landslides
Areas that are generally prone to slow-moving slides are those that on existing old landslides, at the base of slopes, in or at the base of minor drainage hollows, at the base or top of an old fill slope, at the base or top of a steep cut slope or on developed hillsides where leach field septic systems are used.

Areas that are typically considered safe from slow-moving landslides are those on hard, non-jointed bedrock that has not moved in the past, are on relatively flat-lying areas away from sudden changes in slope angle, are at the top or along the nose of ridges or are set back from the tops of slopes.

Features that might be noticed prior to major landsliding include: appearance of springs, seeps, or saturated ground in areas that have not typically been wet; new cracks or unusual bulges in the ground, street pavements, or sidewalks; soil moving away from foundations; ancillary structures such as decks and patios tilting and/or moving relative to the main house; tilting or cracking of concrete floors and foundations; broken water lines and other underground utilities; leaning telephone poles, trees, retaining walls, or fences; offset fence lines; sunken or down-dropped road beds; rapid increase in creek water levels, possibly accompanied by increased turbidity (soil content); sudden decrease in creek water levels though rain is still falling or just recently stopped; sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb.

Rock falls are a generic term referring not only to rock falls, in the strict sense, but also to rock slides, debris slides, debris flows, and rock avalanches. Most rock falls are associated with triggering events, such as earthquakes, rainstorms, or after a rapid melting of snow. The magnitude and proximity of the earthquake, intensity and duration of the rainfall, thickness of the rapidly melting snowpack, can all influence the triggering of rock falls. However, some rock falls occur without any obvious triggering event. It is usually thought that these rock falls are probably due to the gradual release of stress. Rock falls can range in size from small individual rocks of less than a cubic yard to rock avalanches of several million cubic yards. Even a rapidly moving small boulder can cause serious injury to a person and considerable damage to vehicles or buildings.

Landslides can be both damaging and deadly. The U. S. Geological Survey in 1998 estimated that, in the United States, slope failures cause in excess of $1 billion in damages and from 25 to 50 deaths each year. Figure 1 illustrates the common types of landslides.

What is an Earthquake?

Earthquakes occur without warning and can cause injury and death, major economic loss, and social disruption (Utah Seismic Safety Commission, 1995). An earthquake is the abrupt rapid shaking of the earth caused by sudden slippage of rocks deep beneath the earth's surface. The rocks break and slip when the accumulated strain exceeds the rock's strength. The surface along which the rocks slip is called a fault. Seismic waves are then transmitted outward from the earthquake source producing ground shaking.

Table 5 Effects of Earthquakes by Type of Disruption

Principal earthquake hazards, expected effects, and hazard-reduction techniques (modified from Utah Seismic Safety Commission, 1995).

Earthquakes cause a wide variety of geologic hazards including ground shaking, surface faulting, liquefaction and related ground failure, slope failure, regional subsidence, and various types of flooding (See Table 5).

Ground shaking is the most widespread and typically most damaging earthquake hazard (Lund, in press). Strong ground shaking can last from several seconds to minutes, and can be amplified or attenuated depending on local soil and rock conditions. Ground shaking is usually strongest near the earthquake epicenter and decreases away from that point. The type and quality of construction plays a large role in determining the extent of damage caused by ground shaking. Large earthquakes (> M 6.5) are commonly accompanied by surface faulting. The rupture may affect a zone tens to hundreds of meters wide and up to kilometers long. Little can be done from a design perspective to protect structures or other facilities from the direct effects of surface rupture. Liquefaction, the temporary transformation of a saturated cohesionless soil into a fluid accompanying earthquake ground shaking, occurs in areas of shallow ground water and sandy soils. Liquefaction can cause a variety of kinds of ground failure. Slope failures, including rock falls and landslides, are common in steep terrain during moderate and large earthquakes. Subsidence due to tilting of the downdropped block during a large earthquake can affect large areas extending miles from the surface trace of the fault. Tilting of the ground surface may allow lakes or other water impoundments to inundate formerly dry areas, or lower the ground surface below the local water table causing waterlogged soils and areas of ponded water. Flooding may also

HAZARD	EFFECTS	MITIGATION
Ground Shaking	Damage or collapse of structures	Make structures seismically resistant, secure heavy objects
Surface Faulting	Ground displacement, tilting or offset structures	Set structures back from fault traces
Liquefaction	Differential settlement, ground cracking, subsidence, sand blows, lateral spreads	Treat or drain soil, deep pier foundations, other structural design solutions
Rock Fall	Impact damage	Avoid hazard, remove unstable rocks, protect structures
Landsides	Damage to structures, loss of foundation support	Avoid hazard, stabilize slopes, manage water use.
Subsidence	Ground tilting, subsidence, flooding, loss of head in gravity flow facilities	Create buffer zones, build dikes, restrict basements, design tolerance for tilting.
Flooding	Earthquake-induced failure of dams, canals, pipelines, etc with associated flooding	Flood-proof or strengthen structures, elevate building, avoid construction in potential flood areas

result during an earthquake due to damage of water storage or conveyance structures such as dams, pipelines, and canals.

A variety of magnitude scales are used to measure earthquake size (dePolo and Slemmons, 1990). The magnitude scale in most common use today is the Richter scale (Richter, 1938; Bolt, 1988), which measures earthquake magnitude based on the amount of earthquake-induced ground shaking recorded on a seismograph. The Richter scale has no upper or lower bounds and each one-unit increase in the scale represents a ten-fold increase in the amplitude of ground displacement at a given location. The Richter scale's relation to earthquake energy release is logarithmic so that each one-unit increase on the scale represents a 30-fold increase in energy release. Therefore, a Richter magnitude 6 earthquake is 30 times more powerful than a magnitude 5 earthquake, and a magnitude 7 earthquake is 900 times more powerful than a magnitude 5 event. Unless stated otherwise, all magnitudes reported here are Richter magnitudes. The human detection threshold for earthquakes is about magnitude 2 and significant damage begins to occur at about magnitude 5.5. In the Intermountain West, surface faulting begins at about magnitude 6.5.

What is a Flood?

A flood is a natural event for rivers and streams. Excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto the banks and adjacent floodplains. Floodplains are lowlands, adjacent to rivers, lakes, and oceans that are subject to recurring floods. Hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. Floods kill an average of 150 people a year nationwide. They can occur at any time of the year, in any part of the country, and at any time of day or night. Floodplains in the U.S. are home to over nine million households. Most people killed in flood events are swept away by flood currents, and most property damage results from inundation by sediment-filled water.

Several factors determine the severity of floods, including rainfall intensity or other water source, and its duration. A large amount of rainfall over a short time span can result in flash flood conditions. A small amount of rain can also result in floods in locations where the soil is saturated from a previous wet period or if the rain is concentrated in an area of impermeable surfaces such as large parking lots, paved roadways, or other impervious developed areas.

Topography and ground cover are also contributing factors for floods. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover.

Frequency of inundation depends on the climate, soil and channel slope. In regions where substantial precipitation occurs in a particular season each year, or in regions where annual flooding is derived principally from snowmelt, the floodplains may he inundated nearly every year. In regions without extended periods of below-freezing temperatures, floods usually occur in the season of highest precipitation. In areas where flooding is caused by melting snow, and occasionally compounded by rainfall, the flood season is spring or early summer.

Fortunately, most of the known floodplains in the United States have been mapped. FEMA, administers the NFIP and when a flood study is completed for the NFIP, the information and maps are assembled into a Flood Insurance Study (FIS). An FIS is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community and includes causes of flooding.

The FIS report and associated maps delineate special Flood Hazard Areas (SFHAs), designate flood risk zones, and establish base flood elevations (BFEs), based on the flood that has a 1 % chance of occurring annually, or the 100-year flood. The study may have three components:

- The FIS – Flood Insurance Study text;
- The FIRM – Flood Insurance Rate Map; and
- A separate Flood Boundary and Floodway Map (FBFM) that was issued as a component of the FIS for each community studied prior to 1986. No BFE or flood zone names are shown on the floodway map and people often confuse the white floodway with the white area representing land that is free from flooding. Fly reports published since 1988 have corrected this problem by delineating the floodways as diagonally hatched areas on the FIRMs.

The 100-year flood designation applies to the area that has a 1 percent chance, on average, of flooding in any given year. However, a 100-year flood could occur two years in a row, or once every 10 years. The 100-year flood is also referred to as the base flood. The base flood is the standard that has been adopted for the NFIP. It is a national standard that represents a compromise between minor floods and the greatest flood likely to occur in a given area and provides a useful benchmark.

Base Flood Elevation (BFE), as shown on the FIRM, is the elevation of the water surface resulting from a flood that has a 1 % chance of occurring in any given year. The BFE is the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum (NVD) of 1929, the North American Vertical datum (NAVD) of 1988, or other datum referenced in the FIS report.

Special Flood Hazard Area (SFHA) is the shaded area on a FIRM that identifies an area that has a 1% chance of being flooded in any given year (100-year floodplain).

FIRMS show different floodplains with different zone designations. These are primarily for insurance rating purposes, but the zone differentiation can be very helpful for other floodplain planning purposes. The more common zones are listed in Figure 2.

Floodway is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood without raising the water surface elevation by more than one foot.

Figure 2 Flood Zones

Zone A	The 100-year or base floodplain. There are six types of A zones:	
	A	The base floodplain mapped by approximate methods, i.e., BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone.
	A1-30	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).
	AE	The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-A30 zones.
	AO	The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.
	AH	Shallow flooding base floodplain. BFEs are provided.
	A99	Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined.
	AR	The base floodplain that results from the de-certification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection.
Zone V and VE	**V**	The coastal area subject to a velocity hazard (wave action) where BFEs are not determined on the FIRM.
	VE	The coastal area subject to a velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. B zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.	
Zone C and Zone X (unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as exceeding the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood.	
Zone D	Area of undetermined but possible flood hazards.	

NGVD - National Geodetic Vertical Datum of 1929, the national datum used by the NFIP. NGVD is based on mean sea level. It was known formerly as the "Mean Sea level datum of 1929 (MSL)." NAVD 88 = North American Vertical Datum of 1988 is being phased in.

It's important to recognize that there is actually a range of floods, other than just the 100-year flood, that could happen within a planning area. For example, a house located close to a flood source might experience some level of flooding every 10 years. The level or depth of flooding is determined by the probability.

The probability of a flood is based on a statistical chance of a particular size flood (expressed as cubic feet per second of water flow) occurring in any given year. The annual flood is usually considered the single greatest event expected to occur in any given year. The percent annual chance of floods is estimated based on watershed and climatic characteristics or watershed models, water surface elevations, and hydraulic models that reflect topographic characteristics.

The risk created by the 100-year flood would be much greater than the risk from the annual flood based on the amount of damages each event produces - once. But the annual flood would occur much more frequently and over time may in fact produce a much greater risk to the structure than the 100-year flood.

Flood frequencies can be determined by dotting a graph of the size of all known floods for an area and determining how often floods of particular size may occur. In addition, hydrologic and hydraulic data gathered from rivers and streams is a valuable but time-consuming effort to calculate flood frequencies. If at least 20 years worth of data are available through stream gauging, models can be used to determine the statistical frequency of given flood events.

The USGS maintains river gauge records. Historical and current river gauge information can be observed at its Website at http://water.usgs.gov. Some local agencies may also have gauge records.

Conditions that may exacerbate or mitigate the effects of floods

The following factors will affect the severity of a flood:

- Impermeable Surfaces: Excessive amounts of paved areas or other surfaces upstream or in the community can increase the amount and rate of water runoff. Development affects the runoff of stormwater and snowmelt when buildings and parking lots replace the natural vegetation, which normally would absorb water. When rain falls in an undeveloped area, as much as 90 percent of it will infiltrate the grounds in a highly developed area, as much as 90 percent of it will run off.

- Steeply sloped watersheds: In hilly and mountainous areas, a flood may occur minutes after a heavy rain. These flash floods allow little or no warning time and are characterized by high velocities.

- Constrictions: lie-grading or filling within or on the edge of floodplains obstructs flood flows, backing up floodwaters onto upstream and adjacent properties. It also reduces the floodplain's ability to store excess water, sending more water downstream and causing floods to rise to higher levels. This also increases floodwater's velocity downstream of the constriction.

- Obstructions: Bridges, culverts and other obstructions can block flood flow and trap debris causing increased flooding upstream and increased velocity downstream.

- Debris: debris from the watershed, such as trees, rocks, and parts of damaged buildings, increases the hazard posed by moving water. Moving water will float drag or roll objects, which then act as battering rams that can knock holes in walls and further exacerbate the effects of debris.

- Contamination: Few floods have clear floodwater, and the water will pick up whatever was on the ground within the floodplain, such as soil, road oil, farm and lawn chemical and animal wastes. In addition, if a wastewater treatment plant was inundated, the wastewater will likely include untreated sewage. Contamination is also caused by the presence of hazardous material storage in the floodplain and in the community, as well as upstream from the community.

- Soil saturation: rainfall in areas already saturated with water will increase the runoff.

- Velocity: Flood velocity is the speed of moving water, measured in feet per second. High velocities greater than 5 feet per second can erode stream banks, lift buildings off their foundations and scour away soils around bridge supports and buildings.

Flooding from Dam Failure

The five counties in southwest Utah - Beaver, Garfield, Iron, Kane, and Washington - have a total of 145 dams; these dams have been classified as Low, Moderate, and High for potential hazard by the State of Utah Division of Water Rights.

For mitigation purposes we will focus on the dams that are designated as a High Hazard. Each county will have details of all the dams designated as High in the Five County Jurisdiction.

What is Volcanism?

Eruptions from volcanoes can cause widespread property damage and fatalities. Worldwide over 27,000 human fatalities have resulted from volcanic activity in the past 500 years (Mabey, 1985). During the past several tens of millions of years, southwestern Utah has experienced extensive volcanism (Bugden, 1992). Early in that time period large statovolcanoes and caldera complexes erupted huge volumes of lavas and extensive sheets of volcanic debris and ash that often covered hundreds to thousands of square miles with thick layers of volcanic materials. These large volcanic centers are no longer active today, but later, smaller volcanoes have produced eruptions of chiefly basaltic lava flows and volcaniclastic debris, and are still potentially active in many areas of southwestern Utah. Characterized by comparatively small cones constructed of typically black or red cinders, these young volcanoes have been intermittently active for the past approximately 3 to 4 million years. The most recent eruptions from some cinder cones in southwestern Utah and northwestern Arizona may be as young as a 1000 years, and in the Black Rock Desert near Fillmore, a flow as young as 600 years has been identified (Bugden, 1992). Although seemingly old, these young flows are of an age compatible with the most recent surface-faulting earthquakes in southwestern Utah and a potential for future eruptions exists. It is anticipated that the effects of future eruptions will be localized (likely confined to an area of a few to several tens of square miles), but many populated areas in southwestern Utah (St. George, Hurricane, La Verkin, Veyo, Dammeron Valley, Enoch, Brian Head, Duck Creek, Panguitch Lake) are located on or immediately adjacent to young volcanic cones or lava flows and could be severely impacted by future eruptions.

What is Drought?

Drought is a normal and recurring feature of climate. Although it occurs in virtually all of the world's climatic zones, its characteristics vary significantly from one region to another. In some of the world's most arid regions, a drought occurs when annual precipitation drops below 7 inches per year, while in the world's most moisture rich regions, a period of 6 days without rain might constitute a drought! Consequently, there is no universal definition of drought. In the most general sense, drought is a result of a deficiency of precipitation over an extended period of time, resulting in a water shortage, which impacts normal water usage. The severity of a drought depends upon the degree of moisture deficiency, its duration, and the size of the affected area. Because it is so hard to develop a quantitative definition for drought, it is difficult to determine precisely when a drought starts and ends.

In the United States, droughts have been among the most financially burdensome of all weather related disasters. In fact, in the past 20 years the single largest U.S. weather related disaster was the drought of 1988, which resulted in over 40 billion dollars in damages throughout the central and northeastern portions of the country. Unlike impacts from flood, hurricane, tornado or other weather-related disasters, drought impacts are not always immediate. Following a flood it is fairly easy to tally up the value of the destroyed and damaged property. But the effects of a drought can be felt for years. Failed crops can impact food prices well into the future. Devastated domestic livestock and wildlife herds can also take many years to recover.

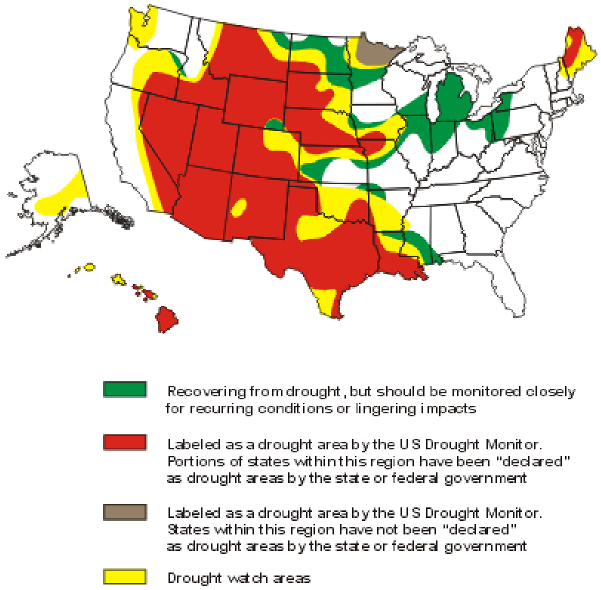
Difficulties of Managing in a Drought Situation

Drought creates unusual management problems due to the uncertainty surrounding it occurrence, duration, magnitude, and severity. The climatological and hydrological parameters normally used in defining drought are precipitation, soil moisture, snowpack, runoff, recharge, evapotranspiration, and temperature. Several indices employ indicators to measure the intensity or severity of drought.

Drought Indices

The Palmer Index is the most widely used measure of quantifying drought. An example of this index is shown in the mapped example below, identifying areas in the country generally experiencing drought conditions. The index is universal in that persistently normal temperature and precipitation produce an index near zero in all seasons and climates. In the plains areas originally studied by Palmer, the index is useful in quantifying drought periods; when applied in the mountainous regions of the west, it does not adequately reflect water supply conditions. It does not account for snowpack and runoff, which are the state’s most significant sources of water. It may, however, still be used as an indicator of a trend, particularly over an extended period.

Drought Conditions in the U.S. as of June 2003



What are Problem Soils?

Geologic materials with characteristics that make them susceptible to volumetric changes, collapse, subsidence, or other engineering-geologic problems are referred to as problem soil and rock. Geologic and climatic conditions in southwestern Utah provide a variety of both localized and widespread occurrences of these materials.
Six types of problem soil and rock are found in southwestern Utah: (1) expansive soil and rock with high shrink/swell potential, (2) collapsible soil, (3) gypsum and gypsiferous soil susceptible to dissolution, (4) limestone susceptible to dissolution under some hydro geologic conditions, (5) soil subject to piping (localized subsurface erosion), and (6) active dunes. Some materials, such as expansive soil and limestone, cover large areas, whereas others, like active dunes, are of limited area extent.
Geology and climate are the main factors which influence the distribution of problem soil and rock. The geologic parent material largely determines the type of problem present. For example, expansive soil is most often associated with shale, and karst dissolution features form in limestone and gypsiferous formations. Weathering and erosion are controlled by local and regional climate. A prime example of the influence of climate is collapsible soils, which are common in arid southwestern Utah, but much less common in wetter northern Utah. (Engineering & Environmental Geology of Southwestern Utah, 1992, K. Harty)

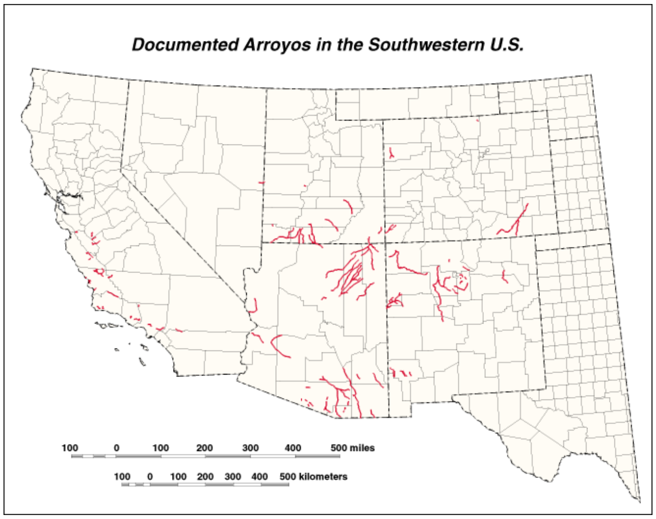
Arroyos

Description of Arroyos
An arroyo is a nearly vertically walled, flat floored stream channel that forms in fine, cohesive, easily eroded material. Arroyos can cut as deeply as 20 meters (65 feet) into the valley floor, are often wider than 50 meters (165 feet), and can be hundreds of kilometers long.

Arroyos exist throughout the western United States, but are most common in arid and semi-arid climates in the Southwest (see Figure 3). The rapid widening and deepening of arroyos have both changed the physical environment and been a costly nuisance in the west since settlement began in the mid 1800's.

Earlier Cycles of Cutting and Filling
The most recent period of arroyo formation in the southwest, which occurred from about 1865 to 1915, was not unique. Previous cycles of arroyo cutting (erosion) have occurred at about 2000 years Before Present (B.P.) and 700 years B.P. These cycles of arroyo cutting were both followed by slower periods of filling (alluviation). Since about 1915, arroyo development, with a few notable exceptions, has slowed with many arroyos showing aggradation. The primary modifications since this time have been widening of trenches, grading of walls, aggradation, and slow changes in bed levels.

Figure 3



Causes of Arroyo Formation
Three factors may cause arroyo formation, but the relative contribution of each is difficult to discern. The main factor is thought to be a change in climate that produced unusually heavy rainfall. Land-use practices, such as grazing, may have enhanced arroyo formation in the southwest during the most recent period of erosion (A.D. 1865-1915). A natural cycle of erosion and deposition caused by internal adjustments to the channel system is a third possibility

Climate
Flooding caused by heavy rain may produce arroyos. Although climate records in the southwest were not systematically kept before about 1900, recent studies have found evidence for unusually heavy rainfall in Tucson, Arizona during the late 1800's . This rainfall was caused by strong and frequent ENSO (El Nino Southern Oscillation) events, suggesting that heavy rain was a regional phenomenon. Thus, the climate of the Southwest during the most recent period of arroyo

entrenchment was conducive to large floods . Drainages may have been especially vulnerable to arroyo cutting, if unusually wet ENSO conditions occurred immediately following a period of below normal precipitation. During a dry period, the enervated vegetation would not have its normal capacity to protect the soil from rain-drop impact or to absorb and slow runoff.

Land use

With the settlement of the West came the rapid introduction of cattle, sheep, and horses. From 1870 to 1890 the number of livestock in New Mexico increased from 300,000 to 2,300,000 . Similar increases were reported in other Western states during this time. Valley floors, which were the most dependable forage areas for the animals, were quickly overgrazed. The fragile vegetation was consumed, and the soil was compacted and left extremely susceptible to erosion. To further exacerbate the soil conditions, both humans and livestock created trails along stream channels and nearby hillsides forming small ditches, leaving the land surface susceptible to arroyo formation.

Nevertheless, earlier periods of arroyo formation predated the introduction of livestock, and thus overgrazing cannot be solely responsible. Spanish and Mexican ranchers, moreover, introduced large numbers of livestock in the 1700's without associated erosion. For these reasons, other factors such as climate change may have played a more important role in arroyo formation.

Natural Internal Adjustments

A third explanation for arroyo development involves external forcing and climate change as triggering mechanisms for incision. This theory postulates that the system has to be in a state ready for incision and involves random, heavy rain and flood events along with internal adjustments in the channel system. If a cloudburst occurs over a drainage, it may deeply erode a single channel, leaving hanging valleys where tributaries enter. Future runoff through the tributaries would cause incision at their mouths and arroyo elongation through upstream migration of headcuts . As sediment accumulates in stream valleys, the gradient of the water course changes. When the slope builds to a critical point, entrenchment may be triggered causing arroyo formation. This type of arroyo formation causes the channel to shift laterally across the stream bed with each cycle of incision. An example of this phenomenon is illustrated from the 800-year entrenchment history of Red Creek in Utah based on tree-ring data from trees growing in the flood plain. The author concluded that lateral movement of the stream channel in its flood plain was responsible for controlling arroyo development.

Summary

While it is arguable which component has contributed the most to arroyo formation in the Southwest, it is widely accepted that climatic events, human settlement and land use, and naturally occurring internal adjustments in drainages are probable causes. The temporal coincidence of the causes may have magnified the effect of each factor.

Effects of Arroyo Cutting

Swamps in the Southwest during the Last Century

Observations before 1865 describe verdant river bed marshes, known as cienegas, containing beaver ponds, fish, and tall grasses which were nourished by high water tables. These marshes have since been drained by arroyos, altering the flora and fauna of the area by widening and deepening the original stream channel.

Decreased Agricultural Productivity

Arroyo formation can be very destructive to agriculture. As soon as arroyo cutting begins, the surrounding water table is lowered making irrigation difficult. Arroyos can quickly remove as much as 25% of their valley floor, covering downstream agricultural land with unwanted flood-borne sediment. This sediment does not improve the fertility of the underlying alluvial soil because it contains large quantities of sand and gravel that originate from subsoils and deposits of soil forming materials.

Flooding

The often excessive deposits of sediment from upstream arroyo formation can decrease flood protection by reducing the natural regulatory functions of stream channels. Sediment from upstream arroyo erosion fills channels that otherwise would store flood water. Arroyos also increase flood severity by changing the geometry of the stream channel. Development of an arroyo in a previously braided or meandering drainage straightens and shortens the channel which limits flood water dispersal and increases velocity.

Displacement of People

Because of the loss of land to arroyos and the increased difficulties of farming, humans have occasionally been forced to either change their agricultural practices or to relocate. Where cropping had depended on irrigation, problems of increasingly fluctuating and decreasingly reliable water sources, and difficulties of transferring water to fields, drove out farmers or forced a change to grazing. Other damages include destruction to roads, railroads, bridges, culverts, fences, and irrigation works. In the late 1880's, the entrenchment of the Rio Puerco in New Mexico forced the desertion of the towns of San Ignacio, San Fernando y Blas, and San Francisco. Prehistoric arroyo cutting may have been one of the main factors leading to abandonment of southern Utah and northern Arizona by the Anasazi.

Corrective Treatments

Attempts to mitigate damage from arroyo cutting date back to the Civilian Conservation Core in the 1930's when attempts were made to slow the erosion of headcuts and banks by reducing grazing and installing control structures. Livestock growers, although fully conscious of the erosion menace, are generally not convinced that their herds are responsible for erosion or that their removal will effect a cure. In one study, isolated tracts of land near arroyo banks were fenced to keep livestock out to promote revegetation. The results varied widely. In some locations, the increase in vegetation stabilized the arroyo walls, whereas in others recovery was insignificant. Other methods of erosion control involve tree planting along banks, the introduction of debris into the channel to slow the flow, and the construction of spreader dikes to catch silt. Unfortunately, such erosion controls are costly. There is no known solution to the arroyo problem.

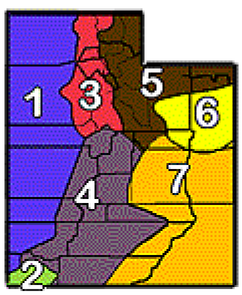
Continued Research and Education

Further research is needed to better understand the rapid and often destructive erosion caused by arroyos in the Southwest. To better conserve soil, we must continue to study the effects of land use practices on arroyo formation and develop efficient and cost-effective erosion control methods. Finally, we must work to model and forecast the effects that future climate change may have on arroyo development. (Brandon J. Vogt, U.S. Geological Survey)

What is Severe Weather?

For the purpose of this mitigation plan the term severe weather is used to represent downbursts, lightning, heavy snowstorms, blizzards, avalanches, hail, and tornados.

Climate



In order to understand the types of severe weather that can occur in the state it is important to understand climate in the state. Utah is a region of diverse topography where wide ranges in temperature and precipitation prevail, and in some parts of the State a wide range in climate is found over short distances, such as the difference between the Cedar City area and St. George. According to the Utah Climate Center, Utah State University, because of the wide range in climate, Utah has been divided into seven climatological divisions. The Five County Association of Governments service area is located in four of those divisions: Dixie (2), Western (1), South Central (4) and Southeast (7). The normal pattern of precipitation varies considerably from one division to another. July is one of the wetter months in the Dixie and South East divisions. In the Western division, January is one of the driest months, with only September having less moisture.

Cloudburst

A cloudburst is a torrential downpour of rain which by its spottiness and relatively high intensity suggests the bursting and discharge of a whole cloud at once. In Utah, cloudbursts are usually associated with thunderstorms, and they occur when moisture-laden air rises rapidly and is cooled, thereby suddenly having its moisture-retaining capacity substantially diminished. The storms occur mostly when the air rises on approaching mountain fronts or, in flat areas, when lifted by thermal convection currents. When the storms occur over hilly or mountainous areas the resulting floods debouching from the catchment basins are usually flashy and destructive.

Downbursts

A downburst is a severe localized wind, blasting from a thunderstorm (see Figure 4). Depending on the size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories by size. Microbursts, that cover an area less than 2.5 miles in diameter, and macrobursts, which cover an area with a diameter larger 2.5 miles.

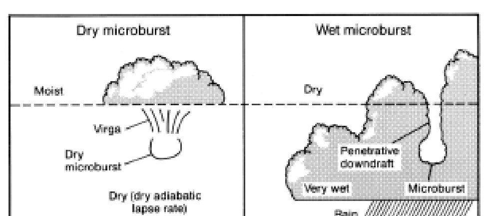


Figure 2

The definition of a microburst depends on its operational use. If wind damage is a concern, then the magnitudes of the wind gusts are important. If aviation is the area of concern, then critical values of the horizontal windshear and magnitude of the downdraft are the important considerations. In field experiments the operational definitions screen out the important events, allowing researchers to focus their attention.

Caracena:
A microburst is a three-dimensional circulation pattern of damaging winds driven outward near the surface by the ground impact of an unusually strong convective downdraft. Its horizontal extent is 5 km or less; and its lifetime is only a few minutes. It may contain Imbedded and leading edge vortices that rotate along a horizontal axis, reaching tornadic strength, presenting an extreme hazard to aircraft taking off and landing. The entire structure of downdraft, severe winds, and imbedded and leading edge vortices constitutes the microburst¹s circulation pattern.

Fujita (1985): A downburst is a strong downdraft which induces an outburst of damaging winds on or near the ground. Damaging winds, either straight or curved, are highly divergent

Macroburst: A large downburst with its outburst winds extending in excess of 4 km (2.5 miles) in horizontal dimension. An intense macroburst often causes widespread, tornado-like damage. Damaging winds, lasting 5 to 30 minutes, could be as high as 60 m/sec (134 mph).

Micorburst: A small downburst with its outburst, damaging winds extending only 4 km (2.5 miles) or less. In spite of its small horizontal scale, an intense microburst could induce damaging winds as high as 75 m/sec (168 mph).

Lightning
During the development of a thunderstorm, the rapidly rising air within the cloud, combined with the movement of the precipitation within the cloud, causes electrical charges to build. Generally, positive charges build up near the top of the cloud, while negative charges build up near the bottom. Normally, the earth's surface has a slight negative charge. However, as the negative charges build up near the base of the cloud, the ground beneath the cloud and the area surrounding the cloud becomes positively charged. As the cloud moves, these induced positive charges on the ground follow the cloud like a shadow. Lightning is a giant spark of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges. When the potential between the positive and negative charges becomes too great, there is a discharge of electricity that we know as lightning.

Heavy Snowstorms
A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period. According to the official definition given by the U.S. Weather Service, the winds must exceed 35 miles per hour and the temperature must drop to 20 degrees F or lower. All winter storms make driving extremely dangerous.

Blizzards
A blizzard is a snowstorm with sustained winds of 40 miles per hour (mph) or more or gusting winds up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening travel conditions. The definition includes the conditions under which dry snow, which has previously fallen, is whipped into the air and creates a diminution of visual range.

Waterspout
Waterspouts are simply tornadoes that form over warm water. This typically occurs in Utah during a cold fall or late winter storms.

Avalanches
Avalanches are a rapid down-slope movement of snow, ice, and debris. Snow avalanches are a significant mountain hazard in Utah, and nationally account for more deaths each year than earthquakes. Avalanches are the result of snow accumulation on a steep slope and can be triggered by ground shaking, sound, or a person. Avalanches consist of a starting zone, a track, and a run-out zone. The starting zone is where the ice or snow breaks loose and starts to slide. The Track is the grade or channel down which an avalanche travels. The run-out zone is where an avalanche stops and deposits the snow.

The two main factors affecting avalanche activity include weather and terrain. Large, frequent storms combined with steep slopes result in avalanche danger. Additional factors that contributing to slope stability are amount of snow, rate of accumulation, moisture content, snow crystal types and the wind speed and direction. In Utah, the months of January through April have the highest avalanche risk.

Topography plays a vital role in avalanche dynamics. Slope angles between 30 to 45 degrees are optimum for avalanches with 38 degrees being the bulls-eye. Slopes with and angle above 45 degrees continually sluff eliminating large accumulation. The risk of avalanches decreases on slope angles below 30 degrees.

Tornadoes
A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornados often occur at the edge of an updraft or within the air coming down from a thunderstorm. Tornadoes can have wind speeds of 250 miles per hour or more, causing a damage zone of 50 miles in length and 1 mile wide. Most tornados have winds less than 112 miles per hour and zones of damage less than 100 feet wide.

Tornadoes are classified by wind damage using the Fujita Scale (see Table 6). The National Weather Service has used the Fujita Scale since 1973. This scale uses numbers from 0 through 5 with higher numbers assigned based on the amount and type of wind damage.

Table 6 Tornado Classifications

Category F0	Gale tornado (40-72 mph)	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
Category F1	Moderate tornado (73-112 mph)	Moderate damage. The lower limit is the beginning of hurricane wind speed; peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
Category F2	Significant tornado (113-157 mph)	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
Category F3	Severe tornado (158-206 mph)	Severe damage. Roofs and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
Category F4	Devastating tornado (207-260 mph)	Devastating damage. Well-constructed houses leveled; structure with weak foundation blown off some distance; cars thrown and large missiles generated.
Category F5	Incredible tornado (261-318 mph)	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobiles-size missiles fly through the air in excess of 100 yards; trees debarked; incredible phenomena will occur.

What is Insect Infestation?

"Insect" means, but is not limited to, grasshopper, range caterpillar, mormon cricket, apple maggot, cherry fruit fly, plum curculio, and cereal leaf beetle. The above are the main insect pests in the state of Utah. Insect Infestation is pretty self explaining – it is virtually any insect pest that multiplies in numbers that become a pest to humanity. These infestations are usually in the form of insects that eat vegetation mainly crops and forest. This causes a huge loss of money and time for farmers and others who are trying to control the insects.

What is Radon Gas?

Radon is a naturally occurring, odorless, tasteless, radioactive gas produced by the breakdown of uranium in rocks and soil. It is harmlessly dispersed in outdoor air, but when trapped in buildings, can be harmful, especially at elevated levels. Radon is the second leading cause of lung cancer, after smoking. The U.S. Environmental Protection Agency and the Surgeon General have recommended that all residences (except those above the second floor) be tested for radon.

Radon comes from the soil surrounding and beneath the house, especially soil that contains uranium. It typically moves up through the soil into the air above and then into your home through cracks in foundations and walls, openings around sump pumps and drains, and construction joints. The highest concentrations of radon can be found in the lowest levels of the home.

Radon may also be present in well water and can be released into the air in your home when water is used for showering and other household uses. The risk of radon entering homes through water is small compared with that of radon entering through the soil. Usually, radon is not a problem with large community water suppliers, but private wells can contain high levels.

Radon, itself, naturally breaks down and forms radioactive decay products. As you breathe, the radon decay products can become trapped in your lungs. As these decay products break down further, they release small bursts of energy. This can damage sensitive lung tissue and lead to lung cancer over the course of a person's lifetime. If you smoke, and your home has high radon levels, your risk of developing lung cancer is especially high.

An estimated 14,000 deaths each year can be attributed to excessive radon exposure. Radon does not cause any short-term health effects, such as shortness of breath, coughing, headaches or fever.

Nearly 1 in 15 homes in the U.S. is estimated to have elevated radon levels. Elevated levels have been found in every state. While radon problems may be more common in some areas, any home may have a problem. In addition, the level of radon in a nearby home or building cannot be used to predict the level of radon in your home or building. Two adjacent houses may have very different radon levels. EPA recommends that all homes below the third floor be tested for radon and that all schools are tested.

The only sure way to determine if you have a problem with radon in your home or business is to test. Use an Environmental Protection Agency approved test kit. The EPA recommends that homes with levels of 4 picocurie/liter (pCI/L) or higher should mitigate. Four pCI/L is considered the "action level."

There are two general ways to test for radon, a short-term test, and a long-term test.

Short-term Test: Short-term test kits remain in your home from two days to 90 days depending on the device and are available at a discount price from the Utah Safety Council.

Long-term test: Long-term test kits require a minimum testing period of 90 days and maximum of one year. Long-term radon test kits are available through the National Radon Hotline at (800) SOS-RADON.

Radon reduction measures can vary with radon levels, but most often the measures cost no more than having a new hot water heater installed or having the house painted. The cost of a contractor fixing a home generally ranges from $500 to $2500, depending on the characteristics of the house and choice of radon reduction methods. For a list of EPA approved contractors in Utah, contact: Utah Safety Council; 5263 South 300 West, Suite 201 Salt Lake City, Utah 84107

Profile of Natural Hazard Events in Southwestern Utah

Wildfire

This wildfire history is arranged by each county in the Five County Region and based on information from the Division of Forestry, Fire & State Lands, it includes information gathered for the period from 1984 to 2002.

Beaver

Beaver County had 286 fires between 1984 and 1996 of these fires five of them burned at least 5,000 acres or more. The cause of these five fires was lightning, and they were called the Negro Mag, the Milford Pass, the Milford Bench, the Honey Boy, and the Cunningham.

Between 1997 and 2000 there were 91 fires recorded of these there was one that was significant in size; it was the Meadow Springs fire which was caused by miscellaneous means and burned 1,226 acres on 7/31/1999.

In 2001 there were 21 recorded wildfires, and the largest one (caused by lightning) was the Cowboy fire on July 18th and it burned 30 acres.

Garfield

Garfield County had 64 fires between 1984 and 1996, with one over 5,000 acres; this fire was on 7/14/97. Lightning caused this fire and it was called the Uinta Flats fire.

Between 1997 and 2000 there were 42 fires recorded of these there was one that was significant in size; it was the Dog Valley fire which was caused by miscellaneous means and it burned 1,204 acres on 10/15/1999.

In 2001 there were 3 recorded wildfires all of which were quite small, however, the largest one (caused by miscellaneous activity) was the Henery Fire on June 16th and it burned ½ of an acre.

Iron

Iron County had 246 fires between 1984 and 1996 of these fires there were none that was in the 5,000 acre range, however, there were four that burned between 1,000 and 4,999 acres. The cause of these four fires were; two by lightning (Coyote Pond and Pinion Park), one by a cigarette (Burn Spot Point), and one was incendiary (Hiest North).

Between 1997 and 2000 there were 185 fires recorded of these there were two that were significant in size. One was the Ten Mile which was caused by incendiary means and burned 5,500 acres on 8/6/2000. The other one was the Cogswell Point which was caused by lightning and it burned 4,383 acres on 5/11/97.

In 2001 there were 67 recorded wildfires, and the largest ones (both caused by lightning) were the Baboon fire on June 24th that burned 210 acres and the North Pasture fire on July 28th that burned 200 acres.

Kane
Kane County had 318 fires between 1984 and 1996 of these there were none that was in the 5,000 acre range, however, there were two that burned between 1,000 and 4,999 acres. The cause of these two fires were; Debris Burn (Meadow Creek on 9/28/93), and lightning (Bullock on 7/21/94).

Between 1997 and 2000 there were 203 fires recorded of these there were two that were significant in size. One was the Moccasin Mt. fire which was caused by equipment and it burned 1,561 acres on 7/21/2000. The other one was the Buckskin fire that was caused by lightning and it burned 1,110 acres on 7/28/98.

In 2001 there were 105 recorded wildfires, and the largest one (caused by lightning) was the Lydias Canyon fire on August 5th and it burned 210 acres.

Washington
Washington County had 323 fires between 1984 and 1996 of this 323 five of them burned at least 5,000 acres or more. The cause of these five fires was lightning, and they were called the Cedar Pockets Wash, the Ox Valley Central Meadow, the Mogotsu Complex, and the Indian Reservation.

Between 1997 and 2000 there were 170 fires recorded. Two of these were significant in size. One was the Barn fire which was caused by equipment and burned 1,770 acres on 7/13/1998. The other one was the Pachoon Flat fire that was caused by lightning and burned 2,245 acres on 7/20/97.

In 2001 there were 57 recorded wildfires, three of which were significant. They were the Maple fire on June 22nd that burned 210 acres and was caused by lightning. The River fire on July 16th that burned 200 acres was caused by miscellaneous activity. The Water Canyon fire on August 8th that burned 280 acres was caused by lightning. See Table 7.

Table 7 Wildfire Information by County for 1997

County	# Fire Reports	# of Fires	Private Acres	State Other Acres	Federal Acres	Total Acres	Resources Damaged ($)	Resources Saved ($)
Beaver	**8**	**5**	**5**	**100**	**188**	**293**	**$0**	**$0**
Garfield	**7**	**5**	**2**	**0**	**128**	**130**	**$2,325**	**$4,230**
Iron	**27**	**26**	**22**	**1**	**1,060**	**1,083**	**$10,032**	**$245,100**
Kane	**44**	**39**	**3,011**	**215**	**1,938**	**5,164**	**$254,810**	**$1,435,180**
Washington	**22**	**21**	**80**	**365**	**2,589**	**3,034**	**$534**	**$161,850**
TOTAL	108	96	3120	681	5903	9704	$267,701	$1,846,360

Wildfire History 2001 and 2002
The extraordinary forest fire activity over the past few years has resulted in high suppression costs. Prevention dollars are the most effective dollars spent. To reduce fuel loads in the urban/wildland interface prescribed burns were used to restore and maintain the eco system.

During the 2001 fire season over 1,650 acres of private and state lands were burned. The impacts of these fires are described in table 8.

Table 8 Acres Burned and Cost by County

County	Incidence	Acres Burned		Cost
		State/Private	Federal	
Beaver	20	1.5	136	$ 18,905.00
Garfield	4	0.45	0.5	$ 5,208.00
Iron	74	42	444	$ 115,679.00
Kane	106	103	230	$ 290,000.00
Washington	54	220	475	$ 143,861.00
Region	258	366.95	1285.5	$ 573,653.00

During the 2002 fire season a total of 307 fires were reported in the Five County Region. These fires burned a total of 6,537 state and privately owned acres. Though 22 homes were damaged by fire and 121 people were evacuated, no homes were totally lost. 2,674 hours were spent in suppressing the fires.

On a five year average in 2001 447 acres of state and private land were burned each year while 2340 acres of federal lands were burned. Average suppression costs for the five year period were $207,530.00.

On July 7, 2001 a fire caused by an electrical problem started a brush fire in the vicinity of the Circle Four Farms Blue Mountain Complex. By the time units from Cedar City, Beaver City, Minersville and Milford arrived on scene, a number of buildings were also involved. Final damage assessment from this fire was: 12,890 pigs dead; an employee/office building and four gestation barns were destroyed; and an estimated 25 million dollars in damage, lost revenue and lost wages.

On August 26, 2001 a fast moving fire caused by a lightening strike three days earlier threatened 22 homes and caused the evacuation of 8 people. Local residents found a lone burning tree and thought they had extinguished the fire. However high winds fanned the flame and the fire burned approximately 72.5 acres. 122 personnel were assigned to the fire which ultimately cost $200,000.00 to contain and control.

The 2002 fire season was one of the most intense fire seasons seen in the Five County area. Four years of drought put the area in high to very high class by March. On March 25, 2002, a 250 acre fire was reported in Washington City. Minimal damage was caused by this fire due to the response of local fire fighters and an air tanker from New Mexico. In April a single and first lightening storm of the season sparked three fires.

On June 4 of 2002 a lightening storm started numerous fires in the area of “Big Wash”. The fire threatened numerous homes in the Webster Flat area and, before it was controlled, burned 4,500 acres.

Several other large fires occurred over the course of the season. The Sequoia, Sanford, and Eagle fires along with all the rest burned a total of 93,000 acres in Southwestern Utah.

It should be noted that that in 2003 one of the most costly fires occurred west of St. George. The human caused Apex Fire burned approximately 29,933 acres between June 28 and July 4, 2003 and cost of more than $2 million to suppress. Reseeding and regeneration of the area is expected to cost taxpayers another $1.3 million.

Landslides

Southwestern Utah contains many areas subject to landslide hazards, mainly on steep slopes underlain by slide-prone geologic units. The most frequently occurring landslides in the region include rock falls, slumps, debris slides, and debris flows. All counties in southwestern Utah contain prehistoric landslides and damaging historical failures. Landslides in Beaver and western Garfield Counties are predominantly in clay-rich Tertiary volcanic tuffs in and near the Tushar Mountains. In the plateaus of eastern Iron County, landslides have formed mainly in Tertiary volcanic rocks, the Tropic Shale, and the Moenkopi Formation. Throughout Washington County, landslides are common in the Petrified Forest Member of the Chinle Formation. In western Kane County, landslides occur predominately along cliffs where the Dakota Formation, Tropic Shale, and Carmel Formation crop out.

Landslides are common in areas of high precipitation, high elevation, steep slopes, and slide-prone geologic materials. In southwestern Utah, many of these conditions exist in the mountains and high plateaus of the Basin and Range and Colorado Plateau physiographic provinces, and along cliffs in the southern Colorado Plateau.
Rock falls consist chiefly of rock fragments that detach from parent bedrock along joints, bedding planes, or other zones of weakness. Rock falls occur in areas of southwestern Utah where un-vegetated, near-vertical cliffs border plateaus, mesas, and buttes, and where deeply incised stream channels in bedrock are abundant. Debris slides commonly initiate in the soil mantle or in weathered bedrock and colluvium that forms a thin cover over bedrock on steep slopes. Debris flows can cause damage and loss of life in developed areas at canyon mouths far-removed from the failure source. Deep-seated landslides, particularly rotational slumps, generally fail along a contact between two different bedrock units, or within a particular slide-prone geologic formation. Deep-seated landslides can block river channels and may cause flooding of areas both downstream and upstream of the blockage.

There have been approximately 660 landslides documented in southwestern Utah. The geologic units where these have been documented are the Sevier River Formation, Tertiary volcanic rocks, Claron Formation, Tropic Shale, Carmel Formation, Chinle Formation, Moenkopi Formation, Wheeler shale, and the Chisholm Formation. Additionally, these formations are strongly affected by weathering and erosion and thus are particularly prone to land sliding where factors such as slope angle, precipitation, aspect, and geologic structure are favorable.

County Landslide Profiles

Beaver

The majority of landslides identified in Beaver County occur in the Tushar Mountains east of Beaver. The U.S. Forest Service identified over 300 landslides in the Beaver, Piute and western Sevier County area. Most of these have occurred in Tertiary volcanic tuffs. Although most of the landslides mapped in this area likely occurred in prehistoric times, a number of landslides in the Tushar Mountains have reactivated as a result of road-building activity. There has been renewed landsliding in ash-flow tuffs in the mountains east of Beaver. Approximately 104 landslides occurred between 1978 and 1981 along a 3-mile stretch of Utah State Route 153 in Beaver Canyon. Highway widenening and oversteepening of slopes begun in 1962 are cited for the increase in frequency of landsliding and the reactivation of some of these older slope failures. Although major landslide movements in the area have decreased in recent years, rock falls and shallow slope failures continue to impact this road.

Garfield

As with Beaver County, many slides in Western Garfield County are in mountainous areas in Tertiary-age volcanic tuffs. One such concentration of landslides in volcanic rocks occurs in the Little Creek Peak area of the northern Markagunt Plateau about 9.3 miles west of Panguitch. There is a concentration of about 20 landslides about 15.5 miles east of Panguitch, in the southern Sevier Plateau/northern Paunsagaunt Plateau region. Most of these landslides are in the Oligocene/Eocene-age Claron Formation, a fluvial and lacustrine unit that contains soft shale strata conducive to landsliding. During the winter of 1982-1983, a damaging landslide in the Claron Formation was initiated by meltwater from the heavy snowpack. This landslide was located on an embankment of State Route 12 near Tropic and undermined and damaged a portion of the road such that one mile of highway had to be reconstructed.

Iron

Landslides in Iron County are concentrated in the plateaus on the eastern part of the county. Over fifty landslides have been identified in the Bear Valley/Little Creek Peak region of Northeastern Iron County about 12.4 miles northeast of Parowan. Most of these landslides formed in the Tertiary volcanic tuffs of the Mount Dutton Formation and tuffaceous sandstones of the Bear Valley Formation. Numerous landslides also occur along and east of the Hurricane Cliffs near Parowan, Cedar City and Kanarraville. In these areas, landslides are common in the clay-rich Cretaceous Tropic Shale and in mudstones of the Triassic Moenkopi Formation. Landslides are also found in the Claron Formation north and east of Kanarraville.

A number of large, prehistoric landslides lie within close proximity to populated areas of eastern Iron County. Two examples are the Green Hollow and Square Mountain landslides, respectively 1.9 and 3.7 miles south of Cedar City in the Hurricane Cliffs. These complex landslides are failures in the Tropic Shale, and involve approximately 290 and 47 million cubic yards of material respectively. These two landslides both measure 2.5 miles from head to toe. These landslides likely failed in the late Pleistocene or early Holocene, but the main scarp of the Green Hollow landslide has produced historical earth and debris flows, and recent rock falls.

An example of a recent, damaging slope failure in eastern Iron County is the Cedar Canyon landslide, about 7 miles east of Cedar City. In the early morning hours of March 27, 1989, a 1.5 million cubic yard complex landslide moved down the north-facing slope of Cedar Canyon. A failure in the Tropic Shale, the landslide destroyed about one-third of a mile of State Route 14, which remained closed to traffic for over a month. The cause of the failure is uncertain, but possible causes include highway or mine-related alterations to slope geometry, drainage, and/or ground-water hydrology.

Kane

Landslides are particularly common in the central and northern parts western Kane County, where the Cretaceous Tropic Shale and Dakota Formation, and the Jurassic Carmel Formation crop out extensively along the Pink Cliffs. All three of these formations, separately and in conjunction, have formed numerous landslides along the southern Pink Cliffs in the north-central part of western Kane County. In this area, the Dakota Formation consists mainly of alternating layers of sandstone and mudstone, with interbeds of coal, claystone, and bentonite. The Windsor Member of the Carmel Formation mainly consists of sandstone with thin beds of siltstone, and is the principle unit involved in landsliding in the Pink Cliffs area. These landslides likely occurred during Holocene time.

The subject of a number of detailed descriptions and studies, the Coal Hill landslide complex of western Kane County has been the most troublesome of any landslide in the county. Affecting an area of about 1.7 square miles, the Coal Hill landslide is a complex failure in the Tropic Shale, Dakota Formation, and the Windsor Member of the Carmel Formation. The main landslide complex, along with about a dozen smaller landslides in the immediate vicinity, have caused extensive damage to State Route 9 in the area between Zion National Park east entrance and Mt. Carmel Junction, since its construction in 1928. Movements of the main landslide complex necessitated realignment of the highway four times between 1930 and 1950. The Utah Department of Transportation completed a major realignment of the highway in 1964, which included rebuilding about two miles of the road. However, the new road alignment was constructed atop what has become a particularly active portion of the landslide complex, and continues to require frequent maintenance.

Washington

Landslides are scattered throughout much of the Colorado Plateau portion of Washington County. Landslides in central and eastern Washington County occur predominately in the Petrified Forest Member of the Triassic Chinle Formation, a mostly lacustrine shale unit with local interbeds of sandstone, gypsum, and bentonite derived from volcanic ash.

The high clay content and generally low shear strength make the Petrified Forest Member extremely prone to landsliding. The clays of the Petrified Forest Member hold much moisture and at times become a pasty substance almost capable of moving under its own weight. There are a number of large, prehistoric landslides in the Chinle Formation in the Zion National Park vicinity. During the 1980, slumps in this area damaged a road, a major canal, and utility lines in a subdivision. A recent landslide in the Chinle Formation occurred in May 1992 along the Santa Clara bench in Santa Clara City. The approximately 200 foot long by 100 foot wide slump damaged a utility line and removed backyard property at the top of the bench and deposited that material in the area of what used to be Truman Drive, which is now closed as a result of the landslide. The slump may be the result of a number of factors, including cutting of the base of the slope, lawn watering on the terrace above the landslide, and above average precipitation during the spring of 1992.

One of the largest slope failures in Washington County is the Eagle Crags landslide complex, about 31 miles east of St. George near the Washington/Kane County boundary. Primarily a failure of the Petrified Forest Member of the Chinle Formation, estimated to be about 1.5 miles wide by 2.3 miles long, involved about 180 million cubic yards of material. The landslide complex consists of multiple smaller landslides that show evidence of failure beginning during the Pleistocene era and continuing through historical time. The most recent active portions of the landslide lie adjacent to a creek that bisects the landslide complex, and likely caused local instability through downcutting. Due to the presence of unstable geologic units and active downcutting by both perennial and ephemeral streams, the possibility exists for future movement on portions of the landslide.

Identification of past landslides and areas of geologic conditions susceptible to landslides are crucial steps in reducing landslide hazards in southwestern Utah.

Earthquake

In Utah most earthquakes are associated with the Intermountain seismic belt (Smith and Sbar, 1974; Smith and Arabasz, 1991), an approximately 160-kilometer-wide (100 miles), north-south trending zone of earthquake activity that extends from northern Montana to northwestern Arizona. Since 1850, there have been at least 16 earthquakes of magnitude 6.0 or greater within this belt (Eldredge and Christenson, 1992). Included among those 16 events are Utah's two largest historical earthquakes, the 1901 Richfield earthquake with an estimated magnitude of 6.5, and the 1934 Hansel Valley magnitude 6.6 earthquake, which produced Utah's only historical surface fault rupture. In an average year Utah experiences more than 700 earthquakes, but most are too small to be felt. Moderate magnitude (5.5 – 6.5) earthquakes happen every several years on average, the most recent being the magnitude 5.8 St. George earthquake on September 2, 1992. Large magnitude earthquakes (6.5 – 7.5) occur much less frequently in Utah, but geologic evidence shows that most areas of the state within the Intermountain seismic belt, including southwestern Utah, have experienced large surface-faulting earthquakes in the recent geologic past.

Fault-related surface rupture has not occurred in southwestern Utah historically, but the area does have a pronounced record of seismicity. At least 20 earthquakes greater than magnitude 4 have occurred in southwestern Utah over the past century (Christenson and Nava, 1992); the largest events were the estimated magnitude 6 Pine Valley earthquake in 1902 (Williams and Trapper, 1953) and the magnitude 5.8 St. George earthquakes in 1992 (Christenson, 1995). The Pine Valley earthquake is pre-instrumental and poorly located, and therefore, is not associated with a recognized fault. However, the epicenter is west of the surface trace of the Hurricane fault, so the event may have occurred on that structure. Pechmann and others (1995) have tentatively assigned the St. George earthquake to the Hurricane fault. The largest historical earthquake in nearby northwestern Arizona is the 1959 Fredonia, Arizona, earthquake (approximate magnitude 5.7; DuBois and others, 1982). Since 1987 the northwest part of Arizona has been quite seismically active (Pearthree and others, 1998), experiencing more than 40 events with magnitudes >2.5, including the 1993 magnitude 5.4 Cataract Canyon earthquake between Flagstaff and the Grand Canyon.

Despite the lack of an historical surface-faulting earthquake in southern Utah, available geologic data for faults in the region indicate a moderate rate of long-term Quaternary activity. Mid-Quaternary basalt flows are displaced hundreds of meters at several locations and alluvial and colluvial deposits are displaced meters to tens of meters in late Quaternary time.

Active Faults

Because earthquakes result from slippage on faults, from an earthquake-hazard standpoint, faults are commonly classified as active, capable of generating damaging earthquakes, or inactive, not capable of generating earthquakes. The term "active fault" is frequently incorporated into regulations pertaining to earthquake hazards, and over time the term has been defined differently for different regulatory and legal purposes. In fact, faults possess a wide range of activity levels. Some, such as the San Andreas fault in California, produce repeated large earthquakes and associated surface faulting every few hundred years, while others, like Utah's Wasatch fault and many of the faults in the Basin and Range Province, generate large earthquakes and surface faulting every few thousand to tens of thousands of years. Therefore, depending on the area of interest or the intended purpose, the definition of "active fault" may change. The time period over which faulting activity is assessed is critical because it determines which faults are ultimately classified as hazardous and therefore in need of regulatory mitigation (National Research Council, 1986).

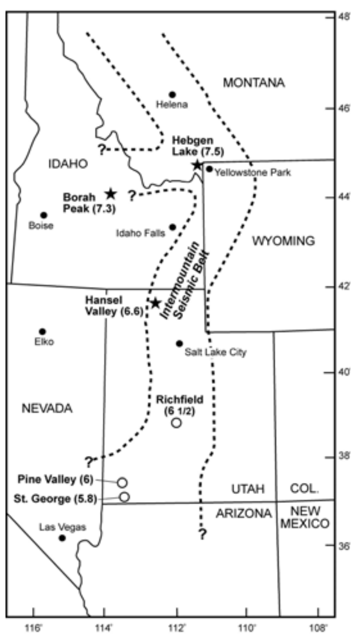


Figure 5 The Intermountain seismic belt and major historicall SB earthquakes.

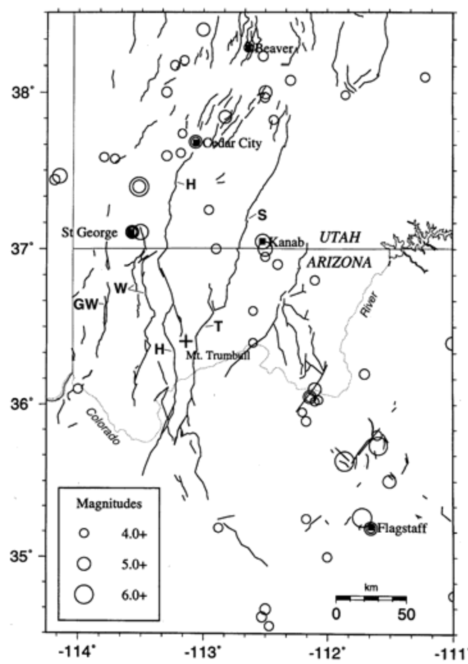


Figure 6 Earthquake epicenter map of southwestern Utah and northwestern Arizona and major Quaternary faults in the region: H = Hurricane fault; W = Washington fault; GW = Grand Wash fault; S = Sevier fault; T = Toroweap fault.

Flood

In the southwest, as elsewhere, flooding, erosion, and sediment discharge are responsible for loss of life, land, and infrastructure, along with damage to reservoirs and natural habitats. Stream flooding is the most prevalent and destructive (annually) of the geologic hazards that affect Utah. This destructive trend is nowhere more evident than in the southwest part of the state.

Two types of stream flooding typically occur in southwestern Utah: riverine floods and flash floods. Riverine floods are usually regional in nature, last for several hours or days, and have recurrence intervals of 25 to more than 100 years. They commonly result from the rapid melt of a winter snow pack or from periods of prolonged heavy rainfall. Flash floods result from thunderstorm cloudbursts. They are localized, quickly reach a maximum flow, and then quickly diminish. Recurrence intervals for flash floods are erratic, ranging from a few hours to decades or longer for a given drainage. Both types of flooding have caused extensive damage in southwestern Utah.

Three major riverine floods have affected southwestern Utah since the area was settled. They occurred in 1966, 1983 and 1984. The 1966 flood resulted from an intense three-day rainstorm that produced record peak flows on the Virgin River. This three-day storm produced between 1 and 12 inches of rain. The 1983 and 1984 floods occurred in response to the rapid melting of maximum-of-record and greater-than-average snow packs respectively. The 1983 and 1984 floods caused several landslides and a dam failure. Total damage was in excess of 640 million and the President issued a disaster declaration for 22 Utah counties. These three floods which usually happen once every 25 to100-years, happened in a 20 year period, this shows how unpredictable riverine flooding is in the southwest.

By nature flash floods are sudden, intense, and localized. Many undoubtedly occur every summer along isolated drainages in southwestern Utah and are never recorded. Flash floods have damaged every major town in southwestern Utah. The first recorded flash flood was on Shoal Creek in Cedar City in 1853. This flood carried away bridges and dams, brought immense quantities of boulders and rocks into town, and did extensive damage to the iron works. Since then more than 300 damaging floods have occurred in southwestern Utah. Many communities have implemented flood-control measures to reduce flash flood hazard; however, as communities expand into unprotected areas, new development is again subject to flash flooding.
Any new development in southwestern Utah must consider the potential for stream flooding, and through proper project planning and design, mitigate any flood hazard that may exist. In areas with a particularly high flood hazard, forgoing development completely may represent the best development alternative.

Floods, whether a riverine or a flash flood, are the most frequent and consistently destructive natural hazard in southwestern Utah. The conditions that cause floods are largely beyond human control; however, humankind can control its actions and do much to reduce the hazard from flooding.

Flood/Flash Flood Deaths in Southern Utah since July 1863:

July 17, 1863 – 4 deaths – Iron County - A flood generated by a series of cloudbursts raised Pine Creek to a level of 20 feet. A house was swept away and four children drowned.

August 5, 1901 – 1 death – Garfield County – A boy drowned while swimming in the gorge 15 miles south of Escalante when a fishnet came down the gulley.

August 10, 1903 – 1 death – Washington County – A man trapped in a flash flood in Dry Creek near Toquerville drowned.

July 30, 1936 – 1 death – Beaver County – Cloudburst rains caused heavy damage to property in Minersville. One woman drowned.

September 17, 1961 – 5 deaths – Washington County – A hiking party of 26 persons was caught in a flash flood in a narrow canyon (termed the Narrows) of the Virgin River in Zion National Park. Five members of that party drowned (scouts). The flood resulted from heavy rainfall and was said by old timers to be the largest they have ever seen coming through the Narrows. The crest of the flood reached 14 feet in some of the narrow gorges.

September 17, 1961 – 1 death – Kane County – At Wahweap Creek near Glen Canyon City a 9-year old girl drowned in a flash flood.

February 18, 1980 – 1 death – Washington County – Flooding was extensive due to heavy rains along the Virgin and Santa Clara Rivers in southwest Utah. A woman and her companion attempted to cross swollen Kolob Creek near Virgin. The vehicle they were riding in was carried several hundred yards downstream with the woman drowning and her companion swimming to safety.

July 27, 1998 – 2 deaths – Washington County – Two male hikers drowned in the Zion "Narrows" during a flash flood. One was 27 years old and the other 31 years old.

September 5, 1998 – 1 death – Kane County – A flash flood in Glen Canyon National Recreation Area's Ice Cream Canyon swept away and drowned a 10-year-old girl. She was standing on the side of the canyon observing the flash flood in the canyon below when the side gave way and she fell in.

May 13, 2001 – 1 death – Washington County – A 10-year-old boy was killed after being swept off a cliff by a "curtain" of water during a flash flood that was falling across a steep cliff-side trail. A second boy was rescued.

The total number of those who have drowned due to floods or flash floods in the Five County Region since 1863 is 18. (Excerpted from: Geology of Southwestern Utah, Utah Geological Association: publication 21, Kimm M. Harty, editor)

Beaver County Dam Information:

Beaver County has a total of 22 dams, six of which are rated as Low, 11 of them are Moderate, and five dams have a rating of High.
The five dams with a rating of High are:

Kent's Lake No 1 (Upper)
Kent's Lake No 2 (Middle)
Manderfield (aka Beaver)
Rocky Ford aka Minersville Reservoir (Beaver)
Three Creeks (Beaver)

Kent's Lake No 1 (Upper)
Owned by Kent's Lake Irrigation Company.
Year completed 1915.

Was last inspected in June of 2003, by Utah Division of Water Rights.
Drainage basin is 1 square mile.
Maximum Dam Breach Flow is 3,000 Cfs.
First downstream town is Beaver and it is 11 miles.
Was breached on September 10th 1988.
There are no visible structures in danger at the highest level of inundation if the dam failed; however, there are a couple of campgrounds that could be affected. There also could be minor damage to the town of Beaver.

Kent's Lake No 2 (Lower)
Owned by Kent's Lake Irrigation Company.
Year completed 1928.
Was last inspected in June of 2003, by Utah Division of Water Rights.
Drainage basin is 1 square mile.
Maximum Dam Breach Flow is 14,000 Cfs.
First downstream town is Beaver and it is 11 miles.
Renovated in 1979.

There are no visible structures in danger at the highest level of inundation if the dam failed; however, there are a couple of campgrounds that could be affected. There also could be minor damage to the town of Beaver.

Manderfield (aka Beaver)
Owned by Manderfield Reservoir and Irrigation Co.
Year completed 1937
Was last inspected in June of 2003, by Utah Division of Water Rights.
Drainage basin is 2.5 square miles.
Maximum Dam Breach Flow is 13,000 Cfs.
First downstream town is Manderfield and it is 12 miles.
AKA Lower Indian Creek.
There are no visible structures in danger of flooding if the Dam fails.

Rocky Ford (aka Minersville)
Owned by Rocky Ford Irrigation Company.
Year completed 1914.
Was last inspected in June of 2003, by Utah Division of Water Rights.
Drainage basin is 531 square miles.
Maximum Dam Breach Flow is 91,000 Cfs.
First downstream town is Minersville and it is 5 miles.
1977 Modified spillway.
The failure of this dam has the potential for great loss of property – there are approximately 158 structures that could be affected. There is also the potential for several sq. miles of property to be affected including agricultural. There could be numerous livestock lost and road closures.

Three Creeks (Beaver)
Owned by Kent's Lake Irrigation Company.
Year completed 1949.
Was last inspected in June of 2003, by Utah Division of Water Rights.
Drainage basin is 12 square miles.

Maximum Dam Breach Flow is 13,000 Cfs.
First downstream town is Beaver and it is 18 miles.
1973 Modified spillway.
There are no structures in immediate danger in the Three Creeks dam fails – there is however, the possibility of campers, hikers, or motorist being affected.

Garfield County Dam Information

Garfield County has a total of 36 dams, 24 of which are rated as Low, eight of them are Moderate, and four dams have a rating of High.
The four dams with a rating of High are:

Oak Creek (aka Upper Bowns)
Panguitch Lake
Tropic
Wide Hollow

Oak Creek (aka Upper Bowns)
Owned by Sandy Ranch.
Year completed 1918.
Was last inspected in August of 2003, by Utah Division of Water Rights.
Drainage basin is 2.5 square miles.
Maximum Dam Breach Flow is 14,000 Cfs.
First downstream town is Hanksville and it is 48 miles.
Was breached in 1973, and then rebuilt in 1982.
There are no structures in immediate danger if the Oak Creek (Upper Bowns) dam fails – there is however, the possibility of wildlife, campers, hikers, and motorist being affected.

Panguitch Lake
Owned by West Panguitch Irrigation and Reservoir.
Year completed 1872.
Was last inspected in July of 2003, by Utah Division of Water Rights.
Drainage basin is 45.7 square miles.
Maximum Dam Breach Flow is 13,000 Cfs.
First downstream town is Panguitch and it is 14 miles.
There are at least 12 structures in immediate danger if the Panguitch Lake dam fails – there is also the possibility of wildlife, campers, hikers, and motorist being affected. If the breach is major enough there is potential for the flood to reach the city of Panguitch, therefore, putting more structures and lives in harms way.

Tropic
Owned by Tropic-East Fork Irrigation Company.
Year completed 1936.
Was last inspected in August of 2003, by Utah Division of Water Rights.
Drainage basin is 86.1 square miles.
Maximum Dam Breach Flow is 11,000 Cfs.
First downstream town is Antimony and it is 31 miles.
New Spillway constructed in 1977.
There are no structures in immediate danger if the Tropic dam fails – there is however, the possibility of wildlife, campers, hikers, and motorist being affected. If there is a large enough of a breach there is a possibility that the Town of Antimony may have 10 to 15 structures

affected – there should be time enough to evacuate those in danger due to the distance involved.

Wide Hollow

Owned by New Escalante Irrigation Company
Year completed 1954.
Was last inspected in August of 2003, by Utah Division of Water Rights.
Drainage basin is 10 square miles.
Maximum Dam Breach Flow is 43,000 Cfs.
First downstream town is Escalante and it is 2 miles.
No Flashboard in Spillway.
There are no structures in immediate danger if the Wide Hollow dam fails – there is however, the possibility of wildlife, campers, hikers, and motorist being affected. If there is a large enough of a breach there is a possibility that the Town of Escalante may have 100 structures affected, this being the case since the dam is less than 2 miles away there will not be much of a warning.

Iron County Dam Information

Iron County has a total of 29 dams, 10 of which are rated as Low, 11 of them are Moderate, and eight dams have a rating of High.
The eight dams with a rating of High are:

Cedar City – Fiddlers Canyon DB #2
Cedar City – Dry Canyon DB
Cedar City Stephens Canyon DB North
Cedar City Stephens Canyon DB South
Fiddlers Canyon DB #1
Newcastle
Red Creek (Iron)
Yankee Meadow

Cedar City – Fiddler Canyon DB #2

Owned by Kit Wareham.
Year completed UNKNOWN.
Was last inspected in July of 2003, by Utah Division of Water Rights.
Drainage basin is 7.57 square miles.
Maximum Dam Breach Flow is UNKNOWN Cfs.
First downstream town is Cedar City and it is .1 miles.
There are over 255 structures in immediate danger if the Cedar City – Fiddler Canyon DB #2 dam fails – there is also the possibility of wildlife, campers, hikers, and motorist being affected. There is a 45 to 60 minute time frame from when the dam fails to when the water reaches I-15. This can cause substantial damage and possible loss of life due to the timeframe.

Cedar City Dry Canyon DB

Owned by Cedar City Corporation.
Year completed 2000.
Was last inspected in July of 2003, by Utah Division of Water Rights – Dam Safety.
Drainage basin is 1.21 square miles.

Maximum Dam Breach Flow is 1,400 Cfs.
First downstream town is Cedar City and it is 0 miles.
There are over 288 structures in immediate danger if the Cedar City Dry Canyon DB dam fails – there is also the possibility of wildlife, campers, hikers, and motorist being affected. There is less than a 30 minute time frame from when the dam fails to when the water reaches downtown Cedar City. This can cause substantial damage and possible loss of life due to the lack of time to evacuate. Since it is not a large amount of water there should not be substantial loss of property and life.

Cedar City Stephens Canyon DB North
Owned by Kit Wareham.
Year completed 2000.
Was last inspected in July of 2003, by Utah Division of Water Rights – Dam Safety.
Drainage basin is .14 square miles.
Maximum Dam Breach Flow is 200 Cfs.
First downstream town is Cedar City and it is 0 miles.
There would be about 130 structures in immediate danger of flooding if the Cedar City Stephens Canyon DB North dam fails – there is also the possibility of wildlife, campers, hikers, and motorist being affected. There is less than a 30 minute warning for residents west of North Main Street. Those homes before North Main Street will have no time to prepare if the failure is sudden. This dam failure will cause property damage but there should not be a loss of life due to the water crest being only 1 foot high, however, there is still the possibility of loss of life.

Cedar City Stephens Canyon DB South
Owned by Kit Wareham.
Year completed 2000.
Was last inspected in July of 2003, by Utah Division of Water Rights – Dam Safety.
Drainage basin is .14 square miles.
Maximum Dam Breach Flow is 200 Cfs.
First downstream town is Cedar City and it is 0 miles.
There would be about 130 structures in immediate danger of flooding if the Cedar City Stephens Canyon DB South dam fails – there is also the possibility of wildlife, campers, hikers, and motorist being affected. There is less than a 30 minute warning for residents west of North Main Street. Those homes before North Main Street will have no time to prepare if the failure is sudden. This dam failure will cause property damage but there should not be a loss of life due to the water crest being only 1 foot high, however, there is still the possibility of loss of life.

Fiddler Canyon DB #1
Owned by Fiddlers Canyon Development, LTD.
Year completed UNKNOWN.
Was last inspected in July of 2003, by Utah Division of Water Rights.
Drainage basin is .9 square miles.
Maximum Dam Breach Flow is UNKNOWN Cfs.
First downstream town is Cedar City and it is 0.1 miles.
There could be about 100 structures affected if the Fiddler Canyon DB #1 dam fails – there is also the possibility of wildlife, campers, hikers, and motorist being affected. Since the dam is so close to population there will not be a whole lot of warning. This dam failure will cause property damage but there should not be a loss of life due to the water crest being only 1 foot high.

Newcastle
Owned by Newcastle Reservoir Company.
Year completed 1956.
Was last inspected in July of 2003, by Utah Division of Water Rights.
Drainage basin is 134 square miles.
Maximum Dam Breach Flow is 126,000 Cfs.
First downstream town is Newcastle and it is 2 miles.
There could be about up to 10 structures affected if the Newcastle dam fails – there is also the possibility of wildlife, campers, hikers, and motorist being affected. This dam is located in a non-populated area with very few structures in the area. This is a good thing because this dam has the potential for a disastrous result if indeed it did breach. There will be a loss of wildlife and potential for livestock and hikers to be in danger.

Red Creek (Iron)
Owned by Paragonah Canal Company.
Year completed 1980.
Was last inspected in June of 2003, by Utah Division of Water Rights.
Drainage basin is 8.4 square miles.
Maximum Dam Breach Flow is 48,000 Cfs.
First downstream town is Paragonah and it is 8 miles.
There could possibly be 75 structures affected if the Red Creek (Iron) dam fails – there is also the possibility of wildlife, campers, hikers, and motorist being affected. This dam is located in a non-populated area with very few structures in the area. There should be enough time to evacuate parts of Paragonah if there is a major breach since the town is eight miles away.

Yankee Meadow
Owned by Parowan Reservoir Company.
Year completed 1926.
Was last inspected in April of 2003, by Utah Division of Water Rights.
Drainage basin is 2 square miles.
Maximum Dam Breach Flow is 18,000 Cfs.
First downstream town is Parowan and it is 10 miles.
The worse case scenario if the Yankee Meadow dam fails is a potential of over 600 structures being affected in the town of Parowan which is 10 miles downstream. There is also the possibility of wildlife, campers, hikers, and motorist being affected. This dam is located in a non-populated area with very few structures in the area. Although there are few structures and this dam is located in a remote area, the circumstances of a narrow canyons and high water crest if there is a breach will add to the potential risk of loss of property and possibly life, including wildlife.

Kane County Dam Information

Kane County has a total of 20 dams, 18 of which are rated as Low, 2 of them are Moderate, and zero (0) dams have a rating of High.

Washington County Dam Information

Washington County has a total of 37 dams, 11 of which are rated as Low, 10 of them are Moderate, and 16 dams have a rating of High.

The 16 dams with a rating of High are:

Ash Creek
Baker
City Creek Debris Basin – St. George
Enterprise (Lower)
Enterprise (Upper)
Gunlock
Ivins Bench
Kolob Creek
Quail Creek
Quail Creek South Dam
Sand Hollow North Dam
Sand Hollow West Dam
Santa Clara
South Creek – Washington Co
St. George City – Navajo DB
Warner Draw

Ash Creek
Owned by Washington County Water Conservancy District.
Year completed 1960.
Was last inspected in October of 2003, by Utah Division of Water Rights.
Drainage basin is 134 square miles.
Maximum Dam Breach Flow is 25,000 Cfs.
First downstream town is Pintura, 8 miles away.
Modification to the Spillway in 1987.
There are no structures in immediate danger if the Ash Creek dam fails – there is however, the possibility of wildlife, campers, hikers, and motorists being affected. If there is a large enough breach then there may be a possibility that the Town of Pintura could have 20 to 25 structures affected – The major damage that is expected would be to Interstate I-15, since this makes up the dam.

Baker
Owned by Baker Reservoir Company.
Year completed 1950.
Was last inspected in June of 2002, by Utah Division of Water Rights.
Drainage basin is 109 square miles.
Maximum Dam Breach Flow is 4,000 Cfs.
First downstream town is Veyo, 4 miles away.
Repaired the Spillway in 1967, damage was due to a flash flood.
There are structures in immediate danger if the Baker dam fails. If there is a large enough breach, there may be a possibility that the town of Veyo could have 10 to 20 structures affected. There is also the possibility of wildlife, campers, hikers, and livestock being affected.

City Creek Debris Basin – St. George
Owned by St. George City.
Year completed 1989.
Was last inspected in April of 2002, by Utah Division of Water Rights.
Drainage basin is 4 square miles.

Maximum Dam Breach Flow is 20,000 Cfs.
First downstream town is St. George, 1 mile away.
There are potentially 1000 or more structures in St. George that could be damaged if the City Creek Debris Basin dike fails. There is the potential for a major disaster depending on the volume of the dam if it fails. Roads and evacuation routes will be affected – the flood will run down Bluff Street in St. George and will also spill out into Green Valley on the west side of the Black Ridge.

Enterprise (Lower)
Owned by Enterprise Reservoir and Canal.
Year completed 1925.
Was last inspected in July of 2003, by Utah Division of Water Rights.
Drainage basin is 35 square miles.
Maximum Dam Breach Flow is 43,000 Cfs.
First downstream town is Enterprise, 11 miles away.
There are no inundation maps for the Enterprise (Lower) dam – however, there would be danger to hikers, campers, wildlife, motorists, and potentially if the breach is large enough it may reach the city of Enterprise and affect up to 350 structures with flooding etc.

Enterprise (Upper)
Owned by Enterprise Reservoir and Canal.
Year completed 1912.
Was last inspected in July of 2003, by Utah Division of Water Rights.
Drainage basin is 29.1 square miles.
Maximum Dam Breach Flow is 54,000 Cfs.
First downstream town is Enterprise, 12 miles away.
There are no inundation maps for the Enterprise (Upper) dam – however, there would be danger to hikers, campers, wildlife, motorists, and potentially if the breach is large enough it may reach the city of Enterprise and affect up to 350 structures with flooding etc.

Gunlock
Owned by Lower Gunlock Reservoir Corporation.
Year completed 1970.
Was last inspected in June of 2002, by Utah Division of Water Rights.
Drainage basin is 306 square miles.
Maximum Dam Breach Flow is 222,000 Cfs.
First downstream town is Santa Clara, 6 miles away.
1985 Hydroelectric facility built.
There are potentially 250 or more structures in Santa Clara and St. George that could be affected if the Gunlock Reservoir Dam fails – there is also the possibility of wildlife, campers, hikers, and livestock being affected. The Shivwits Reservation will have about seven structures affected and they will have a 41 minute warning, whereas, the city of Santa Clara will have an hour warning before the first crest arrives. This should be enough to evacuate the most susceptible areas.

Ivins Bench
Owned by Ivins Irrigation Company.
Year completed 1943.
Was last inspected in June of 2002, by Utah Division of Water Rights.
Drainage basin is 1 square mile.
Maximum Dam Breach Flow is 20,000 Cfs.

First downstream town is Santa Clara, 5 miles away.
There are potentially 250 or more structures in Santa Clara and St. George that could be affected if the Ivins Bench dam fails – there is also the possibility of wildlife, campers, hikers, and livestock being affected. There are no inundation maps to show the crest height or the flow when breached – but even if small there should be a few structures in Santa Clara that are affected somewhat.

Kolob Creek
Owned by Washington County Water Conservation District.
Year completed 1956.
Was last inspected in October of 2003, by Utah Division of Water Rights.
Drainage basin is 8 square miles.
Maximum Dam Breach Flow is 89,000 Cfs.
First downstream town is Virgin, 23 miles away.
Dam is also called “Big Creek”.
If there is a major dam failure at Kolob Creek dam there could potentially be at least 275 or more structures affected along the Virgin River floodplain. The inundated area will traverse the Virgin River both East and West when it reaches the town of Virgin – there will be flooding in Rockville, Springdale, Virgin, historic Grafton may be lost, and the other towns along the river course including St. George. There will be damage to crops, trails, livestock, campgrounds and wildlife. This will be a significant flood – there will be a little time for authorities to evacuate when the failure occurs.

Quail Creek
Owned by Washington County Water Conservation District.
Year completed 1984.
Was last inspected in March of 2003, by Utah Division of Water Rights.
Drainage basin is 78 square miles.
Maximum Dam Breach Flow is 401,000 Cfs.
First downstream town is Washington City, 5 miles away.
There is a potential for extensive agricultural damage if the Quail Creek dam fails, mainly the damage will be in the Washington Fields area of Washington City. Depending on the size of the failure there could also be a high loss of livestock and wildlife. There will be roads washed away and a chance of loss of life. The inundation will reach Washington in one hour from dam failure and St. George in an hour and a half from dam failure; this gives officials little time to evacuate areas. The flood will follow the Virgin River floodplain. Over 250 structures could be affected.

Quail Creek South Dam
Owned by Washington County Water Conservation District.
Year completed 1990.
Was last inspected in March of 2003, by Utah Division of Water Rights.
Drainage basin is 78.4 square miles.
Maximum Dam Breach Flow is 144,000 Cfs.
First downstream town is Washington, 10 miles away.
There is a potential for extensive agricultural damage if the Quail Creek South dam fails, mainly the damage will be in the Washington Fields area of the city of Washington. Depending on the size of the failure there could also be a high loss of livestock and wildlife. There will be roads washed away and a chance of loss of life. The inundation will reach Washington in one hour from dam failure and St. George in an hour and a half from dam

failure; this gives officials a little time to evacuate areas. The flood will follow the Virgin River floodplain. Over 250 structures could be affected.

Sand Hollow North Dam
Owned by Washington County Water Conservation District.
Year completed 2000.
Was last inspected in March of 2003, by Utah Division of Water Rights.
Drainage basin is (DATA UNAVAILABLE) square miles.
Maximum Dam Breach Flow is 1064 Cfs.
First downstream town is Hurricane City.
There are no structures in immediate danger if the Sand Hollow North dam fails – there is however, the possibility of wildlife, campers, hikers, and motorist being affected. If there is a large enough of a breach there is a possibility that 20 to 25 structures along the Virgin River Floodplain will be affected – there should be time enough to evacuate those in danger due to the distance and volume of water involved.

Sand Hollow West Dam
Owned by Washington County Water Conservation District.
Year completed 2002.
Was last inspected in March of 2003, by Utah Division of Water Rights.
Drainage basin is (DATA UNAVAILABLE) square miles.
Maximum Dam Breach Flow is 1064 Cfs.
First downstream town is Hurricane City.
There are no structures in immediate danger if the Sand Hollow West dam fails – there is however, the possibility of wildlife, campers, hikers, and motorists being affected. If there is a large enough of a breach there is a possibility that 20 to 25 structures along the Virgin River Floodplain will be affected – there should be time enough to evacuate those in danger due to the distance and volume of water involved.

Santa Clara Dam
Owned by City of Santa Clara.
Year completed 1919.
Was last inspected in April of 2003, by Utah Division of Water Rights.
Drainage basin is 7 square miles.
Maximum Dam Breach Flow is 2000 Cfs.
This structure is within Santa Clara City
There are at least 175 structures that will be affected if the Santa Clara dam fails – most of these will be in the city of Santa Clara and will not have much time to evacuate. The flood will traverse the Santa Clara River south through western St. George and into the Virgin River.

South Creek – Washington County Dam
Owned by Trees Ranch.
Year completed 1988.
Was last inspected in October of 2003, by Utah Division of Water Rights.
Drainage basin is 18 square miles.
Maximum Dam Breach Flow is 48,000 Cfs.
First downstream town is Rockville, 5 miles away.
There are about 25 structures that could be affected if the South Creek dam fails – most of these will be along the Virgin River floodplain in the city of Rockville and Grafton. The flood

will traverse the Virgin River southwest through Washington County. It could affect some remote hikers, campers and wildlife.

St. George City – Navajo DB Dam
Owned by St. George Public Works.
Year completed UNKNOWN.
Was last inspected in April of 2003, by Utah Division of Water Rights.
Drainage basin is .386 square miles.
Maximum Dam Breach Flow is 217 Cfs.
First downstream town is Bloomington area of St. George where it is located.
There is not a whole lot of data on this dam – there are quite a few of structures nearby, however, since the CFS is so low there would be minor flooding if any at all.

Warner Draw Dam
Owned by St. George and Washington Canal Company.
Year completed 1975.
Was last inspected in October of 2003, by Utah Division of Water Rights.
Drainage basin is 4.4 square miles.
Maximum Dam Breach Flow is 58,000 Cfs.
First downstream town is NONE (drains to Virgin River) and it is 0 miles.
There is an emergency spillway in place.
There will be at least 250 structures affected if the Warner Draw dam fails – all of these in the Washington Fields area, which is south of the city of Washington. The inundation will affect the fields and empty into the Virgin River, from there it could cause the Virgin River's crest to rise enough to affect structures in St. George etc. There will be agricultural and domestic animals that will be affected when the inundation reaches the Washington Fields.

History of Dam Failure in the Five County Association of Governments (FCAOG) Jurisdiction (Southwestern Utah)

The Quail Creek reservoir dam failed in 1989, and it caused over $5 million in private property damage.

Quail Creek reservoir is located in southwest Utah near St. George. The Quail Creek South Dam was constructed along the eastern limb of the Virgin anticline and is located on Triassic age Moenkopi Formation deposits of predominately highly gypsiferous, siltstone and dolomicrites.

After the failure of the original earthfill dike in 1989, the dam was reconstructed as a roller compacted concrete (RCC) structure with a concrete and RCC cutoff trench which reached a depth of about 75 feet (22.9 m) through the maximum section, a maximum dam height of about 80 feet (24.4 m), and a crest length of about 2150 feet (655 m).

Since completion of the new dam in 1991, seepage has gradually increased. Seepage had been most notable along the left side of the dam, leading to the installation of a toe drain system. During the past few years, subsidence features have been noted down stream of this area. Since January 2002 seepage along the right side of the dam has increased significantly. About 800 feet (244 m) downstream of Station 5+00, water has been flowing out of several closely grouped open eroded fractures in a highly fractured, light greenish gray dolomicrite unit with about 20% visible gypsum. During the Spring, flows from this unit reached peaks of 4.9 cfs and were slightly discolored and cloudy. Analysis showed the flow to be carrying up to 1.4 tons of sediment per day, dropping to about 760 lbs/day 6 days later. (Source – RB&G Engineering, Provo, Utah)

Volcanism

Southwestern Utah experienced prolonged volcanism during the Cenozoic time. Tumultuous eruptions of calc-alkaline volcanics and deposition of volcaniclastic debris dominated early to mid-Cenozoic volcanism. The active volcanic centers in the southwestern district area include the Escalante Deserts in the Basin and Range Province; the High Plateaus and adjacent areas in the Colorado Plateau Province; and the Pine Valley Mountains-St. George Basin and surrounding areas.
The youngest vents and flows in southwestern Utah are less than 1,000 years old. Remote eruptive centers present Utah's most imminent and potentially damaging volcanic hazard.

Past Major Eruptions:
From late Oligocene to early Miocene, stratovolcanoes and caldera complexes generated lavas and layer upon layer of volcaniclastic debris throughout the Basin and Range Province. Straddling the Utah-Nevada border and circling the southern portion of the Needles Range of Beaver and Iron Counties, the Indian Peak caldera complex served as the source for the calc-alkaline volcanics of the 29.5 million year old Wah Wah Springs Formation.

The Bullion Canyon Volcanics and the Mount Belknap Volcanics originated from calderas of the Tushar Mountains in Beaver and Piute Counties. Flows, pyroclastics, and associated rocks from this caldera complex range in age from 25 to 14 million years. South-Central Utah's mid-Cenozoic stratovolcanoes shed volcanistics onto low lands to the south and east, forming an apron of debris that eventually became the southwestern High Plateaus. Local, violent eruptions of andesitic and rhyolitic materials are no longer a hazard in Utah. Between 8 and 6 million years ago basaltic and rhyolitic magmas formed domes, plugs, cones, and shield-like volcanic features in the Great Basin and Range of Southwest Utah.

These predominately mafic-composition volcanics have augmented the present-day landforms in the three volcanic regions of southwestern Utah. Geomorphically fresh features and textures, geothermal anomalies, and recent eruptive histories present convincing arguments for the continuation of volcanic events in southwestern Utah.

There has been caldera-type eruptive volcanic activity in southwestern Utah dated as occurring in the early Cenozoic period. As the geologic conditions that created those types of eruptions has long since disappeared there is zero chance of their repetition. The current hazard relating to volcanic activity is strictly limited to localized, small, cinder cone basaltic eruptions. According to geologists, the hazard is real, but extremely infrequent and would be limited to a relatively small area. Because of the remote potential of these volcanic events affecting the built environment, and threatening people, this hazard is not considered in the same vein as many of the other natural hazards that this plan addresses.

It should be noted that there have been no reports of property damaged or human injuries or deaths attributed to any type of volcanic activity in southwestern Utah, since records have been kept.

Drought

Information on Drought in Southwest Utah is based upon the Palmer Drought Severity Index Chart. The Palmer Index was developed by Wayne Palmer in the 1960s and uses temperature and rainfall information in a formula to determine dryness – it has become the semi-official drought index used today. The Palmer Index is most effective in determining long term drought – several months. The advantage of Palmer Index is that it is standardized to local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions. The negative is that it is not as good for short term forecasts, and is not particularly useful in calculating supplies of water locked up in snow. (NOAA's Drought Information Center)

There are four Climate Divisions in Southwest Utah based: Division 1 – Western, Division 2 – Dixie, Division 4 – South Central, and Division 7 – Southeast. The Palmer Index has information for historic drought data from 1895 to 1995.
Below is the Historic Data by Division:

Division 1 – Western

The Western Division comprises 4,290 square miles or 24% of the total land area of the Five Counties, and is found in the western parts of Beaver, Iron, and Washington counties. Historically the Western Division has followed a drought pattern of normal to wet for 20 years, then having a severe to extreme drought problem that persist for six or seven years. However, 17 of the last 20 years have been severe to extreme drought. The Western Division has been in an extreme drought period since 1999.

Division 2 – Dixie

The Dixie Division comprises 1,423 square miles or 8% of the total land area of the Five Counties, the majority is found in Washington County with a small portion found in Kane County. Dixie Division has had three major drought periods since 1895, with the third one currently happening. The last two lasted at least seven years each and were about 50 years apart. The Dixie Division has been in an extreme drought for approximately four years.

Division 4 – South Central

The South Central Division comprises 9,097 square miles or 52% of the total land area of the Five Counties. The South Central Division is found in all five counties, mainly found in the central part of the Five Counties. The South Central Division has been pretty consistent throughout the 100+ years of record keeping. Until the mid 60's there has been a period of drought every 20 years on average, after the mid 60's the droughts have been more frequent primarily every 10 to 15 years.

Division 7 – Southeast

The Southeast Division comprises 2,813 square miles or 16% of the total land area of the Five Counties. The Southeast Division is found in the eastern half of Kane and Garfield counties. The Southeast Division had an eight year drought just as the other divisions did. Between 1896 to 1904 it was in the extreme part of the index. After this long extreme drought there were basically fifty years of normal to wetter than normal years followed by a four year drought in the mid fifties. Since the drought in the mid fifties there has been a two to three year extreme drought every 10 to 13 years.

Summary

The drought history of the four different divisions in the Five County area has been very similar except for the Southeast division. The Southeast Division is a bit different than the other Divisions, instead of a longer period in-between a drought and then followed with a drought lasting between five to eight years; the Southeast has a shorter period in-between a drought and the droughts are only 2 to 3 years long.

Problem Soil

There are six types of problem soils and rocks that are found in southwestern Utah – these types are listed below.

Expansive Soil

Expansive soil and rock is the most common type of problem deposit in southwestern Utah. In particular, the Jurassic-age Arapien and Cretaceous-age Tropic Shale's, and the Triassic-age Chinle and Moenkopi Formations are sources for expansive materials. Expansive deposits contain clay minerals that expand and contract with changes in moisture content. Clays absorb water when wetted, causing the soil or rock to expand. Conversely, as the material dries, the loss of water between clay crystals or grains causes the deposit to shrink. Expansive deposits are extensive around St. George, Washington, and Santa Clara. In these areas expansive clays in the Chinle Formation have been most damaging to structures. In Santa Clara, many homes and a church were damaged by expansive clays in the Chinle Formation. Common problems are cracked formations, heaving and cracking of floor slabs and walls, and failure of wastewater disposal systems. Sidewalks and roads are particularly susceptible to damage.

Collapsible Soils

Subsidence of the ground surface due to collapsible soil has caused extensive damage in and around Cedar City and the Hurricane cliffs, where it is most prevalent. Collapsible soil is common in Holocene alluvial-fan and debris-flow deposits in southwestern Utah. Soil and rock containing gypsum are also susceptible to subsidence. Collapse occurs when susceptible soils are wetted to a depth below that normally reached by rainfall, destroying the clay-bonds between bands. Collapsible soil is present in geologically young materials such as Holocene-age alluvial-fan and debris-flow sediments, and in some wind-blown silts. In Cedar City approximately $3 million in damage to public and private structures has been attributed to collapsible soil.

Limestone (Karsts Terrain)

Limestone susceptible to dissolution and subsidence occurs throughout mountains west of Sevier Lake, west of Richfield, and south of St. George. Karsts terrain is characterized by closed depressions (sinkholes), caverns, and streams that abruptly disappear underground. Most karsts terrain in southwestern Utah is relict and relates to moisture climates during the Pleistocene, or may have been created by ground water prior to the rock being uplifted and tilted during basin and range faulting. No known damage has occurred to structures from ground collapsing or subsidence related to limestone karsts, but because karsts ground-water systems have little filtering capacity, contamination of ground water is a major concern.

Gypsiferous Soil and Rock
Gypsiferous deposits are subject to settlement caused by the dissolution of gypsum, which creates a loss of internal structure and volume within the deposit. Gypsiferous soil and rock deposits are common in southwestern Utah, particularly along the base of the Hurricane cliffs. Gypsum in these deposits can cause damage to foundations, and induce land subsidence and sinkholes similar to those seen in limestone terrain.

Soils subject to Piping
Piping is subsurface erosion by ground water that moves along permeable, non-cohesive layers in unconsolidated materials and exists at a free face, usually along a stream bank or cliff that intersects the layer. Deposits susceptible to piping are common in the southwestern part of the state. Holocene-age alluvial fill in canyon bottoms is the most common material susceptible to piping in Utah. Collapse of soil pipes and subsequent erosion has damaged roads and agricultural land. Piping can cause damage to roads, bridges, culverts, and any structure built over soils subject to piping. Earth-fill structures such as dams may also be susceptible to piping.

Sand Dunes
Dunes are common surficial deposits in arid areas where sand derived from weathering of rock or unconsolidated deposits is blown by the wind into mounds or ridges. In areas where development encroaches on dunes, inactive or vegetated dunes may be reactivated, allowing them to migrate over roads and bury structures. Sand Dunes occur in the Escalante Desert and west of Kanab. Migration of dunes across roads and burial structures are common problems in areas where active dunes are present. Avoidance of dunes is the best way to prevent damage to structures. However, active dunes usually are a maintenance problem only and do not preclude development.

Severe Weather

Climate
Most of the moisture in the winter comes from fronts that develop in the Gulf of Alaska and move from west to east across the State. Tropical air from the Gulf of Mexico enters the state from the south and west during July through September and is the source of severe and often violent thunderstorms. Tropical Pacific airmasses from the southwest at times have caused extreme floods in the southwest part of the State.

The mountains form barriers to the flow of moisture-laden air, and orographic precipitation may occur any time during the year. Rain shadows, which are areas of reduced precipitation, on the leeward side of the mountains account for the low normal annual rainfall in many of the interior valleys in the State.

Several times during each year, typically, a counterclockwise circulation develops aloft over Utah, usually during May or October, when the general pattern of air movement over the State is changing. This circulation around a low pressure center aloft pulls the lower level air upward into the center of the low pressure, and often results in widespread, heavy precipitation over the entire State for a period of several days. Orographic influences are minor for these convectional-type storms.

Cloudburst storms and resultant floods occur principally during the summer. All parts of the State are subject to these storms, even the flat desert areas of the western portion.

However, they occur more frequently along the west slope of the Wasatch Range, the Colorado Plateaus, and the southwest part of the State.

Tornadoes

Generally speaking, atmospheric conditions are rarely favorable for the development of tornadoes in Utah due to its dry climate and mountainous terrain. In fact, Utah ranks as having one of the lowest incidences of tornadoes in the nation, averaging only about two tornadoes per year, with only one F2 or stronger tornado once every seven years. From January 1950 to June 1, 2000, 97 tornadoes and 22 waterspouts have been reported in the state.

In the central U.S., tornadoes are commonly one-fourth of a mile wide and often cause considerable destruction and death. However, Utah tornadoes are usually smaller in size--often no more than 60 feet wide (at the base)--with a path length usually less than a mile and a life span of only a few seconds to a few minutes. They normally follow a path from a southwesterly to a northeasterly direction and usually precede the passage of a cold front.

About 73% of all Utah tornadoes have occurred in May, June, July and August, when severe thunderstorms occasionally frequent Utah. Also, 69% of all Utah tornadoes have occurred between the hours of Noon and 5:00 PM (MST), while 55% of all waterspouts have happened in the morning hours.

There have probably been more tornadoes and waterspouts in Utah than the following statistics and accounts indicate. In fact, in recent years an increasing number of these storms have been reported--probably due to Utah's increasing population and greater public awareness about twisters. However, sometimes people have mistaken whirlwinds (or dustdevils), microburst winds and other natural phenomena as tornadoes. Thus, every report of possible tornadic activity that appears in this publication has been carefully reviewed and analyzed to assure the greatest degree of accuracy possible.

Snow Avalanches Common in Utah:

Dry or slab avalanches: occur when a cohesive slab of snow fractures as a unit and slides on top of weaker snow, breaking apart as it slides. Slab avalanches occur when additional weight is added quickly to the snow pack, overloading a buried weaker layer. Dry snow avalanches usually travel between 60-80 miles per hour, reaching this speed within 5 seconds of the fracture, resulting in the deadliest form of snow avalanche.

Wet avalanches: occur when percolating water dissolves the bonds between the snow grains in a pre-existing snow pack, this decreases the strength of the buried weak layer. Strong sun or warm temperatures can melt the snow and create wet avalanches. Wet avalanches usually travel about 20 miles per hour

While snow avalanches affecting people in southwestern Utah are rare, they can be deadly. In 1998, a group of Boy Scouts on a winter excursion in the mountains east of Beaver City accidentally triggered a class 3 avalanche that trapped four of them. The avalanche was 100 yards wide and at least 3 feet deep. The Scouts, who were buried in the snow, ran the risk of suffocation. They were lucky that they were only buried for a few minutes and survived with only minor injuries.

Insect Infestation

Insect infestation in Southwestern Utah is varied in location, species of insects and severity of infestation. The Mormon cricket, so called because of the heartache it once brought early Utah settlers, is devouring acres of wheat, barley, and oats in the state. The 2003 infestation, which also affected Idaho and Nevada, might be the worst in recent history. Forests of southwestern Utah are also infested with several species of beetles and other damaging insects.

Grasshopper and Mormon cricket Infestations

The State of Utah Department of Agriculture and Food has said that no one who works for their department has seen it this bad. For the sixth year in a row an estimated 5 million to 6 million acres of farm and ranchland in Utah are infested with crickets and grasshoppers.

A statewide agricultural disaster based on the continued drought, insect infestation, and high winds was recently declared by FEMA providing help from the federal government such as low-interest loans for farmers and ranchers. According to Utah state officials crickets and grasshoppers have caused $25 million in damages from lost crops. According to the Utah Department of Agriculture, wheat, barley, oats, and alfalfa are the main crops affected by the insect infestation, with most of the damage occurring in rural and central Utah. State officials say one cricket can consume 38 pounds of forage during its lifetime.

Utah has a long and colorful history of problems with the insect dating back to the early days. When Mormon settlers attempted to harvest crops in 1848 hordes of crickets swarmed the area destroying the crops. According to state history, failed attempts to fight the crickets sent the Mormon pioneers to their knees in prayer. Thousands of sea gulls appeared and devoured the crickets and saved the crops. On historic Temple Square in Salt Lake City visitors can see a monument to the sea gull that reads: "In grateful remembrance of the mercy of God to the Mormon Pioneers."

The largest infestation of grasshoppers in Utah in 2002 was in Millard County which neighbors Beaver County at the north of this region. 23,024 acres of BLM land in that county were infested with Grasshoppers with 11,512 acres being treated with an insecticide. Mormon cricket populations in 2003 are perhaps the largest in Utah's recorded history. Mormon crickets infestation has now extended into Beaver County reaching to near the northern city limits of Beaver City. Statewide, the acres affected by infestation of grasshoppers and Mormon crickets are shown in Table 15.

Forest Infestations

Forest health is a complicated topic. To keep things simple, this report focuses only on the effects of insects, diseases, and weather on trees. Within that realm, precipitation is crucial for trees to remain vigorous which increases the trees resistance to insects and pathogens. With adequate rainfall or snowmelt, the trees can maintain their defenses; flushing the attacking bark beetles with pitch or growing more leaves and needles to replace those eaten by defoliating insects. Without adequate precipitation, resistance is significantly reduced. The western states, including Utah, have been suffering from drought since 2000. The effect of drought and increased insect activity is becoming noticeable throughout the Intermountain Region.

Spruce Bark Beetle

The spruce beetle (*Dendroctonus rufipennis*) is the most significant natural mortality agent of mature spruce. Endemic populations usually exist in weakened or windthrown trees, logging slash, and fresh stumps. Outbreaks typically occur when beetle populations build to high levels in concentrations of windthrown trees. Dispersing adults may infest standing live trees, initially preferring larger diameter trees. In southwestern Utah, the spruce beetle was responsible for more infested acres in 2001 than any other forest insect pest. The total number of infested acres reached 31,892. Portions of Iron County, located within Dixie National Forest have been experiencing devastating spruce beetle outbreaks for a number of years which started in scattered windthrown trees. As of 2001, the spruce bark beetle had infested the following number of acres by county: Beaver, 839; Garfield, 2,728; Iron, 28,029; Kane, 296; and Washington, none.

Douglas-Fir Beetle

Douglas-fir beetle (*Dendroctonus pseudotsugae*) is the most destructive bark beetle of this tree species in western North American forests. At endemic levels, these insects infest scattered trees of low vigor and poor health. Where there is an abundance of trees of low vigor and poor health, populations can build rapidly and spread to adjacent healthy, green standing trees. All five southwest counties surveyed in Utah have had Douglas-fir beetle caused mortality for a total of 791 acres affecting federal, state, and private land ownerships. These infestations began in the early 1990's and are slowly diminishing. As of 2001, the Douglas-Fir beetle had infested the following number of acres by county: Beaver, 76; Garfield, 387; Iron, 83; Kane, 45; and Washington, 200.

Mountain Pine Beetle

The mountain pine beetle (*Dendroctonus ponderosae*) is a destructive forest insect capable of killing trees on a landscape level, mountain pine beetle (MPB) kills thousands of trees a year during outbreak conditions, and millions of trees during extended epidemic periods in western forests. At endemic levels MPB will favor weakened, less vigorous trees to attack. During epidemics, trees down to 4 inches in diameter may be attacked. Large forest landscapes may be altered, causing a pine forest ecosystem to revert to grass and shrub landscapes for a period of 10-20 years. Wildlife species, composition, and distribution may change, water yields in drainages may increase, and dead trees left after epidemics may serve as a fuel source for wildfires. The MPB has caused tree mortality on 752 acres of forests in southwestern Utah. MPB affects Ponderosa Pines and limber pine. Limber pine is currently experiencing rapid decline in high-elevation pine communities in the western U.S. and Canada. Limber pine is an important element of high-elevation ecosystems in western North American forests. It is a pioneer sub-alpine and alpine species able to establish on cold, dry, and windy sites. Limber pine are important in watershed protection, because they help to stabilize soil and rock on harsh sites, and retain snowpack for extending ephemeral stream flow. As of 2001, the MPB had infested the following number of acres by county: Beaver, 20; Garfield, 386; Iron, 23; Kane, 258; and Washington, 65.

Pinyon Ips

Pinyon Ips (*Ips pilifrons*) is presenting an increasing problem in the pinyon pine forest ecosystem and affecting valuable home landscape trees. Continued drought conditions produce increased tree stress, which causes them to become more susceptible to Ips attack. Pinyon pine mortality observed for 2001 totaled 1,926 acres in Iron and Garfield County. In Iron County 1,680 acres were infested and in Garfield County 246 acres were infested.

Western spruce budworm

Western spruce budworm (*Christoneura occidentalis*) was responsible for 7,296 total acres of defoliation in 2001 in southwestern Utah, defoliating 3,211 acres in Garfield County alone. This insect affected subalpine, white, and Douglas-fir on the Dixie National Forest in Garfield and Iron counties and in the Fishlake National Forest in Beaver County. This defoliation on the Dixie and Fishlake National Forests has been occurring since 1998. In some sites, successive years of defoliation have caused understory tree mortality. As of 2001, the western spruce budworm had infested the following number of acres by county: Beaver, 1,154; Garfield, 3,211; Iron, 2,716; and Kane, 215.

Fir Engraver Beetle

The fir engraver beetle (*Scolytus ventralis*) is a major pest of true firs in western forests. It attacks trees three inches in diameter at breast height (dbh) and larger. Tree stress due to drought, disease, and defoliation may incite outbreaks, causing severe tree mortality. It is often associated with other forest pests such as Douglas-fir tussock moth, spruce budworm, bark beetles, woodborers, and fomes annosus root disease. As of 2001, 348 acres located in southwest Utah were infested with the fir engraver beetle. The following number of acres were affected by county: Beaver, 28; Garfield, 90; Iron, 71; Kane, 70; and Washington, 89.

Radon Gas

Radon is a radioactive gas of geologic origin that is found in many buildings in sufficient concentrations to represent a health hazard to building occupants. Radon is an odorless, tasteless, and colorless radioactive gas which forms as a product in three radioactive decay series. Most common of these is the uranium-decay series. In nature, radon is found in small concentrations in nearly all rocks and soils. Potential radon-hazard areas in southwestern Utah are widespread, and are generally underlain by silicic igneous rocks of low-grade metasedimentary deposits. The results of 36 indoor measurements of radon levels in southwestern Utah confirm predictions that levels are highest, with an arithmetic mean of 8.8 picocuries per liter (pCi/L) in hazard areas defined by geology, and are significantly lower, 2.4 pCi/L, outside of hazard areas (See Table 9).

The U.S. Environmental Protection Agency (EPA) estimates that from 8,000 to 40,000 Americans will die each year from lung cancer caused by long-term radon inhalation.

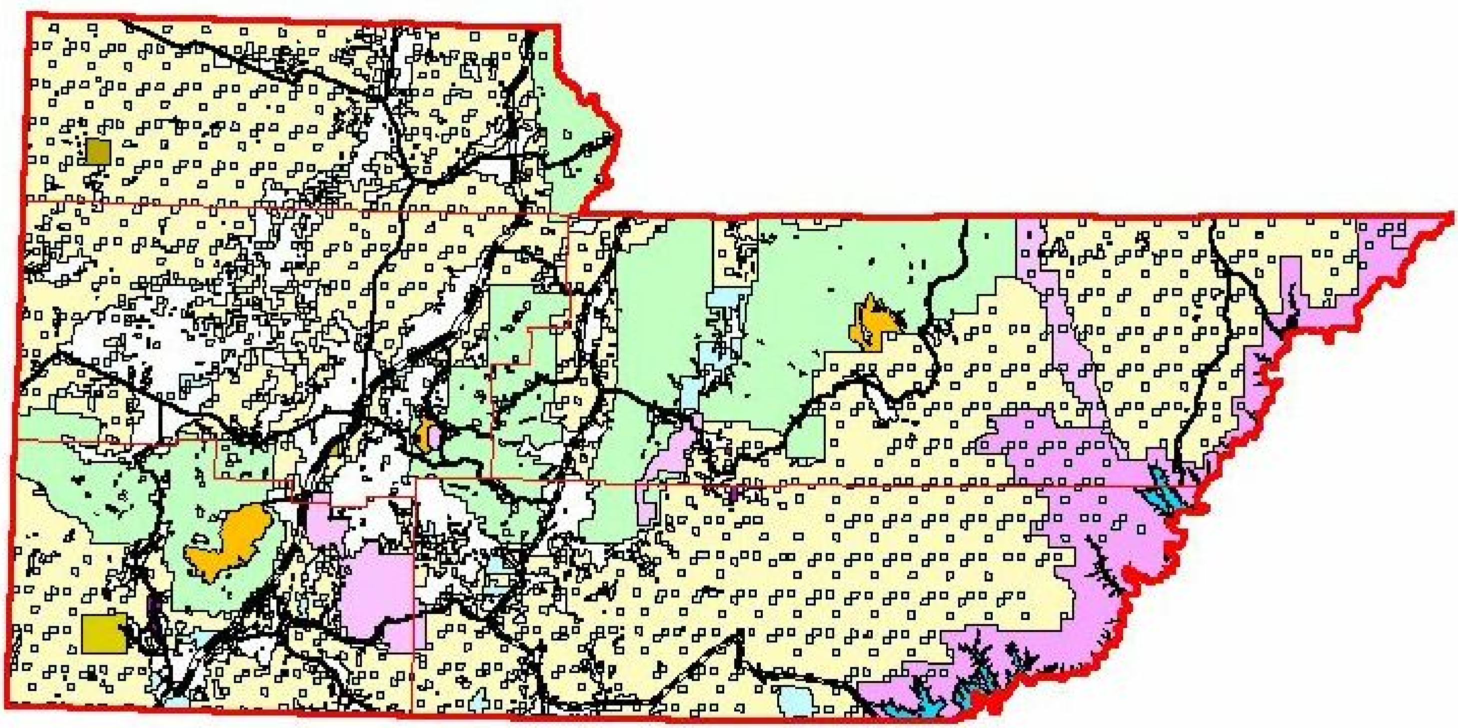
Table 9 Indoor Radon Test Results per City

County	City	#of Tests	Maximum Indoor Radon	In Radon Source Area?
Beaver	Beaver	1	10.5	Yes – 9
Beaver	Minersville	1	2.9	Yes – 9
Garfield	Panguitch	1	3.2	No
Iron	Cedar City	5	2.1	No
Iron	Paragonah	1	3.8	No
Kane	Kanab	1	0.5	No
Kane	Orderville	1	1.9	No
Washington	Enterprise	2	6.8	No
Washington	Hurricane	1	1.1	No
Washington	New Harmony	1	14.3	Yes – 11
Washington	Santa Clara	1	1.2	No
Washington	St. George	1	6.2	No
Washington	Washington	2	2	No

In 1998, in response to growing national concern over the threat of radon gas, Congress enacted Title III, Indoor Radon Abatement Act (IRAA), as an amendment to the Toxic Substances Control Act. The only way to know if a building is subject to radon hazard is for that building to be tested for indoor radon. Geology provides assistance to decision-makers, but decisions cannot be based on geology alone.

Annexes

Region Annex



Introduction

Why is this plan presenting several hazards on a regional basis?

Many of the hazards being assessed in this Hazard Mitigation Plan have widespread effects on multiple jurisdictions and are therefore being considered on a regional (multi-jurisdictional) basis with regards to impact. These multi-hazard action items are those activities that pertain to the following hazards in the mitigation plan: radon gas, insect infestation, drought, severe weather and volcanism.

Radon gas is a naturally occurring phenomenon that affects widespread areas of the state. The effects are very specific to the homes and businesses located in an area with a higher propensity for radon gas exposure and to the design of those structures, their placement and specific local geology. Mapping of the potential for radon gas is usually done at a very large scale and as such provides at best an indication of the potential for radon gas impact. For this reason this plan addresses radon gas on a regional (multi-jurisdictional) basis.

Insect infestation in most cases extends beyond the jurisdictional boundaries of communities and in many cases extends across county lines. For that reason this plan looks at the history, effects and mitigation of insect infestation on a regional (multi-jurisdictional) basis.

Likewise, drought differs from other natural hazards in several ways. First, it is a "creeping phenomenon," making its onset and end difficult to determine. The effects of drought accumulate slowly over a considerable period of time and may linger for years after the termination of the event. Second, the absence of a precise and universally accepted definition of drought adds to the confusion about whether or not a drought exists and, if it does, its severity. Third, the societal impacts of drought are less obvious and extend over a larger geographical area than damages that result from other natural hazards. Drought seldom results in structural damage. For these reasons the quantification of impacts and the provision of disaster relief is a far more arduous task than it is for other natural hazards. It is for this reason that this plan is considering drought on a regional (multi-jurisdictional) basis.

Severe weather has similar effects over a wide area, such as when a large mass of tropical moisture moving into the state develops summer cloudburst storms over a wide area of southwestern Utah. The level of risk created by severe weather events is dependent, in many situations, on specific local conditions such as available drainage potential or a community's exposure to certain wind related hazards, such as tornados. All areas of this region are subject to potential for lightning related hazards. But in general these events affect all areas in similar manners and are not unique to a specific local, as is the case with landslides or wildfire. For this reason, severe weather is being addressed on a regional (multi-jurisdictional) basis.

Finally, the Utah Geological Association (Keaton, UGS Publication 21, 1992) states that the likelihood of renewed volcanic activity in the region during the next 100 years appears to be very unlikely. Their report also states that future volcanic activity probably will consist of localized eruptions of basaltic cinders and liquid basaltic flows which are controlled by topography. As volcanic eruptions during modern history have not occurred without some warning, sufficient indications of an impending volcanic eruption would provide sufficient time to formulate and implement a mitigation and contingency plan. Such a plan would need to be based upon specific details of the location and topography of a specific event.

Because of the extremely small likelihood of activity and the lack of specific data on where an event may actually occur, volcanism is being addressed on a regional (multi-jurisdictional) basis.

Volcanic Hazards In Southwestern Utah

There have been several major volcanic eruptions worldwide during the past 25 years. Among these were the eruption in 1980 of Mt. St. Helens in Washington State followed by the 1982 eruption of El Chichón in Mexico, the 1990 eruption of Mt. Pinatubo in the Philippines, and the 1995 eruption of the Soufriere Hills Volcano in Montserrat all generated unprecedented awareness to the potential calamitous effect of volcanic hazards. Fortunately, these events have not had any significant effect on residents of Southwestern Utah.

The U.S. Geological Survey and other scientific communities world-wide responded to the need for advanced understanding of the volcanic processes, related hazards, and well-defined mitigation procedures by encouraging research and funding studies in volcanology. During the 1980s the United States established volcano observatories in Vancouver, Washington; Anchorage and Fairbanks, Alaska; and Long Valley, California.

Over 270,000 human fatalities have resulted world-wide from volcanic activity during the past 500 years. Information from the Utah Geological Survey indicates that while most of the deaths world-wide have been related to the eruptions of high-silica alkali composition volcanics, fatalities and property damage can result from basaltic and rhyolitic flows, plugs and dome, features that are typical of volcanism throughout southwest Utah.

According to experts, the social and economic consequences of volcanic hazards can be far-reaching. Damage and loss can be effectively reduced by understanding volcanic processes, identifying active or potentially active eruptive centers, delineating extent of lands potentially affected by future eruptions, educating landowners and policy makers, and instituting a comprehensive mitigation strategy.

In order to suggest volcanic hazard reduction procedures, it is important to examine southwestern Utah's recent volcanic activity, delineate active eruptive centers in the study area, define hazards expected to accompany future eruptions and examine how volcanoes outside the state of Utah may impact southwestern Utah.

When discussing volcanic hazards several problems arise. Because of the intermittent nature of volcanic eruptions and lengthy recurrence intervals, people tend to minimize volcanic hazards as a threat to property and lives.

Southwestern Utah experienced prolonged volcanism during the Cenozoic time. Tumultuous eruptions of calc-alkaline volcanics and deposition of volcaniclastic debris dominated early to mid-Cenozoic volcanism. The active volcanic centers in the southwestern district area include the Escalante Deserts in the Basin and Range Province; the High Plateaus and adjacent areas in the Colorado Plateau Province; and the Pine Valley Mountains-St. George Basin and surrounding areas.

From late Oligocene to early Miocene, stratovolcanoes and caldera complexes generated lavas and layer upon layer of volcaniclastic debris throughout the Basin and Range Province. Straddling the Utah-Nevada border and circling the southern portion of the

Needles Range of Beaver and Iron Counties, the Indian Peak caldera complex served as the source for the calc-alkaline volcanics of the 29.5 million year old Wah Wah Springs Formation.

The Bullion Canyon Volcanics and the Mount Belknap Volcanics originated from calderas of the Tushar Mountains in Beaver and Piute Counties. Flows, pyroclastics, and associated rocks from this caldera complex range in age from 25 to 14 million years. South-Central Utah's mid-Cenozoic stratovolcanoes shed volcanistics onto low lands to the south and east, forming an apron of debris that eventually became the southwestern High Plateaus.

Local, violent eruptions of andesitic and rhyolitic materials are no longer a hazard in Utah. Between 8 and 6 million years ago basaltic and rhyolitic magmas formed domes, plugs, cones, and shield-like volcanic features in the Great Basin and Range of Southwest Utah.

These predominately mafic-composition volcanics have augmented the present-day landforms in the three volcanic regions of southwestern Utah. Geomorphically fresh features and textures, geothermal anomalies, and recent eruptive histories present convincing arguments for the continuation of volcanic events in southwestern Utah.

Utah presents an unusually varied landscape with three major physiographic provinces extending into the state. The Rocky Mountain Province takes up a V-shaped section of northeastern Utah and includes the Uinta and Wasatch mountains. The Colorado Plateau Province dominates east central and southeastern Utah from the Uinta Basin south to Canyonlands and the high plateau country. Western Utah lies in the Basin and Range Province, an area of deserts as well as mountain ranges separated by broad valleys. Within these three provinces, Utah ranges in elevation from 2,350 feet above sea level in the southwest corner of the state to 13,528 feet on Kings Peak in the Uinta Mountains. Five major life zones, each with a distinctive community of plants, are found within that elevation range, from the sagebrush and juniper typical of the Sonoran desert to the meadow grass and moss of the alpine tundra.

Volcanoes are created by internal forces within the Earth that cause heated, melted rock (magma) to rise to the surface. First collecting in magma chambers, some of the magma eventually pushes upward through cracks (vents) to the Earth's surface. As the magma reaches the surface, it loses some of its gases and turns into lava. Volcanoes are created by the release and build-up of lava and other materials. Volcanoes have varied shapes and sizes, but are divided into three main kinds depending on the type of material that reaches the surface and the type of eruption that ensues. Utah has all three types.

The youngest vents and flows in southwestern Utah are less than 1,000 years old. The only current hazard would strictly be from local, small cinder cone basaltic eruptions (Lund, UGS, correspondence 2003). It appears, rather than local events, remote eruptive centers present Utah's most imminent and potentially damaging volcanic hazard. Areas east of Mt. St. Helens were the recipients of ash fallout.

(Portions excerpted from: Utah.gov Website - "A Brief History of Utah", 2002, and Utah Geological Survey Website, 2002)

Utah's Volcanic Types

Composite or Stratovolcanoes

Composite volcanoes (stratovolcanoes) develop from repeated explosive and nonexplosive eruptions of tephra (airborne lava fragments that can range in size from tiny particles of ash to house-size boulders) and lava that build up layer by layer. These volcanoes are the largest and form symmetrical cones with steep sides. Some composite volcanoes in Utah are in the Tushar Mountains (Mount Belknap, for example) in Piute County. Now extinct, they are too old (between 32 and 22 million years) to maintain the classic volcanic shape of their modern-day counterparts, such as Mount Hood and Mount St. Helens in the Cascade Range along the northwestern coast of the United States.

Shield Volcanoes

Shield volcanoes form from "gentle" or nonexplosive eruptions of flowing lava. The lava spreads out and builds up volcanoes with broad, gently sloping sides. The low-profile shape resembles a warrior's shield. In Utah a good example is the one-million-year-old Fumarole Butte in Juab County. Currently active volcanoes of this type are found in the Hawaiian Islands.

Cinder Cones

Cinder cones build from lava that is blown violently into the air and breaks into fragments. As the lava pieces fall back to the ground, they cool and harden into cinders (lava fragments about 1/2 inch in diameter) that pile up around the volcano's vent. Cinder cones are the smallest volcanoes and are cone-shaped. Cinder cones are found in many areas of Utah including Millard, Iron, Garfield, Kane, and Washington Counties, and they vary in age. The youngest, only about 600 years old, are in the Black Rock Desert in Millard County.

Dome Mountains

Dome Mountains are formed from hot molten material (magma) rising from the Earth's mantle into the crust that pushes overlying sedimentary rock layers upward to form a "dome" shape. Unlike a volcano, the magma typically does not reach the Earth's surface. Instead, the magma cools underneath the surface and forms the core of the mountains. Dome mountains in Utah include Navajo Mountain and the La Sal, Abajo, and Henry Mountains in the southeastern part of the state.

Volcanic Fields in Southwestern Utah

Mineral Mountains-Cove Fort Volcanic Field

The Mineral Mountains-Cove Fort volcanic field is a Quaternary bimodal, basalt-rhyolite association with some intermediate composition units. Silicic volcanism began at 800,000 years ago with eruption of two fluid, aphyric, rhyolite flows (3 kilometers long, 80 meters thick) along Bailey Ridge and Wildhorse Canyon. Subsequent activity from 700,000 to 500,000 years consisted of pyroclastic eruptions and extrusion of at least 11 domes distributed over 10 kilometers along the crest and western flank of the Tertiary Mineral Mountains pluton. Tephra from these eruptions are abundant in the lacustrine deposits of the Beaver Basin. East of the Mineral Mountains are lavas of basalt, basaltic andesite, and latite which erupted before the silicic episode of the Mineral Mountains and persisted afterwards. Activity began with outpourings of the tholeiitic basalt of the Black Rock field from vents on the eastern margin of the Mineral Mountains, followed by basaltic andesite of the Maderfield and Crater Knoll fields. Latite lavas were then erupted from Red Knoll cinder cone, followed by quartz-bearing basaltic andesite from the topographically dominant Cove

Fort cinder cone. The youngest lavas are latite of the Cedar Grove field, erupted from a cinder cone on the southwest margin of the Cove Fort field. In these two younger units surface features are readily apparent, including pressure ridges, squeezeups, and pahoehoe textures. The Mineral Mountains-Cove Fort volcanic field is approximately 300 kilometers south of Salt Lake City and approximately 100 kilometers north of Cedar City, Utah. Access to the silicic volcanoes of the Mineral Mountains is from the west via Milford, Utah. Interstate 15 crosses the Cove Fort flows immediately north of the interchange with Interstate 70.

Grass Valley
From North of Grass Valley on Grass Valley Road -- Pull off at crest of hill to view geologic features on east side of Grass Valley. Grass Valley is another eroded anticline produced by an unexposed intrusion that is interpreted to be an extension of the Pine Valley intrusion exposed in the hills to the right. The white cliffs just above the valley floor are exposures of the ash-flow tuff member of the rocks of Paradise overlain by the Big Mountain slide mass. The Rencher Formation was not deposited this far east. The Big Mountain slide is overlain by fanglomerates of the Page Ranch Formation and the Pine Valley slide mass. Overlying the Pine Valley slide is the Timber Mountain flow member of the Pine Valley Latite that extruded northward from the Pine Valley laccolith following the collapse of its flank by gravity sliding. Rencher Peak (source area for the slightly older Rencher Peak flow member of the Pine Valley Latite) is the high peak visible on the north side of Grass Valley. Continue south on Grass Valley road for one mile. Cinder cone of quartz-bearing basalt on right. Lava from this and other vents dammed Grass Valley, which then filled in with fluvial sediments and minor lacustrine deposits to form the relatively broad valley floor. Many fertile valleys in this area formed in this manner, including Pine Valley, Grassy Flat, and Diamond Valley.

Harmony Mountains
Harmony Mountains consist mostly of faulted Tertiary ash-flow tuffs.

Harmony Hills Tuff
Above the Bauers Tuff is the brown and tan, crystal-rich Harmony Hills Tuff (22.5 Million Years Ago). These unfractured ash-flow tuffs represent autochthonous rocks tilted eastward by the Iron Mountain Intrusion to the west.

Mountain Meadow Monument and Overlook
From the entrance road to Mountain Meadow monument -- proceed to the overlook parking area on Dan Sill Hill. You will pass a gravel road on the left that leads to the gravesite in Mountain Meadow. This is the site of the infamous 1857 massacre of about 120 emigrants while they were traveling the Old Spanish Trail that traverses Mountain Meadow. Park in monument parking lot and take short paved trail to monument overlook on Dan Sill Hill. The hill is made of the upper ash-flow tuff member of the Rencher Formation overlying allochthonous Claron rocks of the Big Mountain slide. Northwest of Mountain Meadow is Big Mountain (with radio towers on top) at the northern end of the Bull Valley-Big Mountain arch. The Big Mountain dome consists of Iron Springs rocks and locally some Carmel limestone and intrusive quartz monzonite. In this denuded area of the arch, the Iron Springs and/or Claron are overlain by the upper ash-flow tuff of the Rencher Formation. The hills on the east side of Mountain Meadow (east of SR-18 behind you) consist of the Big Mountain slide that originated on Big Mountain. These hills contain a thick section of the conspicuous allochthonous white lower Rencher, which has slid eastward from the crest or flank of the Bull Valley – Big Mountain arch prior to the eruption of the upper Rencher.

Mt. Belknap
Composite volcanoes (stratovolcanoes) develop from repeated explosive and nonexplosive eruptions of tephra (airborne lava fragments that can range in size from tiny particles of ash to house-size boulders) and lava that build up layer by layer. These volcanoes are the largest and form symmetrical cones with steep sides. Some composite volcanoes in Utah are in the Tushar Mountains (Mt. Belknap, for example) in Piute County. Now extinct, they are too old (between 32 and 22 million years) to maintain the classic volcanic shape of their modern-day counterparts, such as Mount Hood and Mount St. Helens in the Cascade Range along the northwestern coast of the United States.

Pine Valley Mountains
Rocks of the Pine Valley Mountains consist mostly of volcanic and intrusive rocks that range in age from Oligocene to Quaternary that were erupted upon or intruded into Mesozoic and Tertiary sedimentary rocks. The laccolithic bodies belong to a group of more than a dozen closely related, early Miocene intrusions that constitute a magmatic province trending northeasterly across the structural transition zone between the Basin and Range and Colorado Plateau in this region, generally along the trend of the Sevier orogenic front. Because laccoliths of the Iron Springs district and eastern Bull Valley Mountains are well aligned within the belt and have produced sizable iron deposits, the belt has known informally as the “Iron Axis” (Toby, 1976; Blank and others, 1992; Rowley and others, 1995; Hacker, 1998). Intrusions of Iron Axis affinity were forcibly emplaced within 3.0 to 0.25 kilometers of the surface as bulbous laccoliths, sills, and other partly concordant bodies, and were emplaced within the axial zones of some of the older, southeast-vergent Sevier thrusts and folds (Mackin, 1960). The largest Iron Axis intrusion forms the gigantic (>200 square kilometers) igneous mass capping the Pine Valley Mountains.

Snow Canyon State Park
Red Navajo sandstone, capped by an overlay of black lava rock, makes photography, hiking, biking, and camping in Snow Canyon a double treat. Early spring and fall use of the park is especially appealing due to southern Utah's moderate winter climate. Two recent volcanic cones are found near the head of the canyon.

Snow Canyon Inverted Topography
About 3 million years ago, after erosion coupled with regional uplift profoundly denuded the area of overlying rocks, volcanic eruptions began spitting scalding, pungent, black seas of basalt onto the land. Fiery channels of hot, molten rocks snaked their way over the earth and down into stream beds, valleys, and canyons; enveloping all that stood in their paths. These rivers quickly hardened into rocks, forming resistant, thick sheets of basalt that invaded and obstructed paths of rivers and steams. Seeking avenues of least resistance, drainages continued along their courses by shifting to the edges of the basalt flows (that now filled the earlier channels) and slicing new routes through the softer sedimentary rocks of the Navajo Sandstone. Erosion continued along the new channels until the water routes grew in size from stream beds, to ravines, to deep canyons. The sheets of basaltic rocks that initially filled low areas, cooled into resistant masses and eventually stood in relief as high ridges and plateaus. New volcanic eruptions occurred with lavas again invading flat lands, furrows, gullies, and depressions. This second blanket of basalt covered an area topographically lower than the first. Three distinct phases of the "inverted topography" are evident in Snow Canyon State Park. The oldest layer forms the plateau to the east of State Highway 18 (the road from St. George to Veyo). The next forms the plateau on which the highway is built, and the third forms the floor of Snow Canyon itself.

Snow Canyon Cinder Cones

Sometime between 1,000 to 10,000 years ago the youngest series of volcanic eruptions began emanating from cinder cones and vents in the north section of the park. Following drainage channels etched in soft sandstones along the sides of solidified volcanic flows, the new, scalding flows crept south onto the floor of Snow Canyon and nearby areas. Today, these flows line the canyon floor stretching south to the Santa Clara River.

Flows in the Park

Numerous features and textures characteristic of volcanic flows are well preserved in the park. For example, visitors to West Canyon can see motionless black cascades of basalt, and areas where the flows encircled mounds of Navajo Sandstone and cascaded down steep embankments onto the canyon floor. Hikers will notice that these black falls appear to have ended abruptly when they touched the floor of West Canyon. In truth, however, they extended across the canyon and, in places, may have touched the walls on the opposite side. Shifting desert sands and flash-flood debris of more recent times have obscured floor basalts in most areas.

St. George

A line of Quaternary lava flows and cinder cones stretches from St. George, Utah, nearly 200 kilometers northeastward to the village of Loa. Additional young vents and flows extend approximately 50 kilometers north of St. George. Volcanism near St. George is best known and most spectacular; lava flows erupted from vents in the Pine Valley Mountains flowed downslope into river valleys. Four different episodes of flow emplacement have been recognized, each preserving underlying Mesozoic rock from further erosion. The oldest flows, formed 3-6 million years ago, are up to 300 meters thick above their surroundings, and the younger flows occur at approximately 120 meters (1-2 million years ago), on the present drainage (500,000 years ago), and fill stream valleys (a few thousand years).

Santa Clara Flow

The most recent flows came from two cinder cones in Diamond Valley, 16 kilometers north of St. George. The cones, approximately 400 meters wide and 60 meters high, are the sources for the Santa Clara flow which traveled 16 kilometers to the south. Geomorphological features to be seen along the flow include inverted valleys, lava dammed lakes, displaced drainages, and 120-meter-high lava cascades. The Santa Clara flow can be viewed along State Highway 18, west of St. George in and around Snow Canyon State Park.

Tushar Mountains

Interstate-15 Exit 95, intersection with State Road 20 - Virtually all rocks you see to the west, north, and east consist of volcanic mudflow breccia of the Mount Dutton Formation. The high Tushar Mountains are mostly rhyolites of the Mount Belknap Volcanics, within the Mount Belknap caldera.

Zion National Park

Zion is located along the edge of a region called the Colorado Plateau. The rock layers have been uplifted, tilted, and eroded, forming a feature called the Grand Staircase, a series of colorful cliffs stretching between Bryce Canyon and the Grand Canyon. The bottom layer of rock at Bryce Canyon is the top layer at Zion, and the bottom layer at Zion is the top layer at the Grand Canyon.

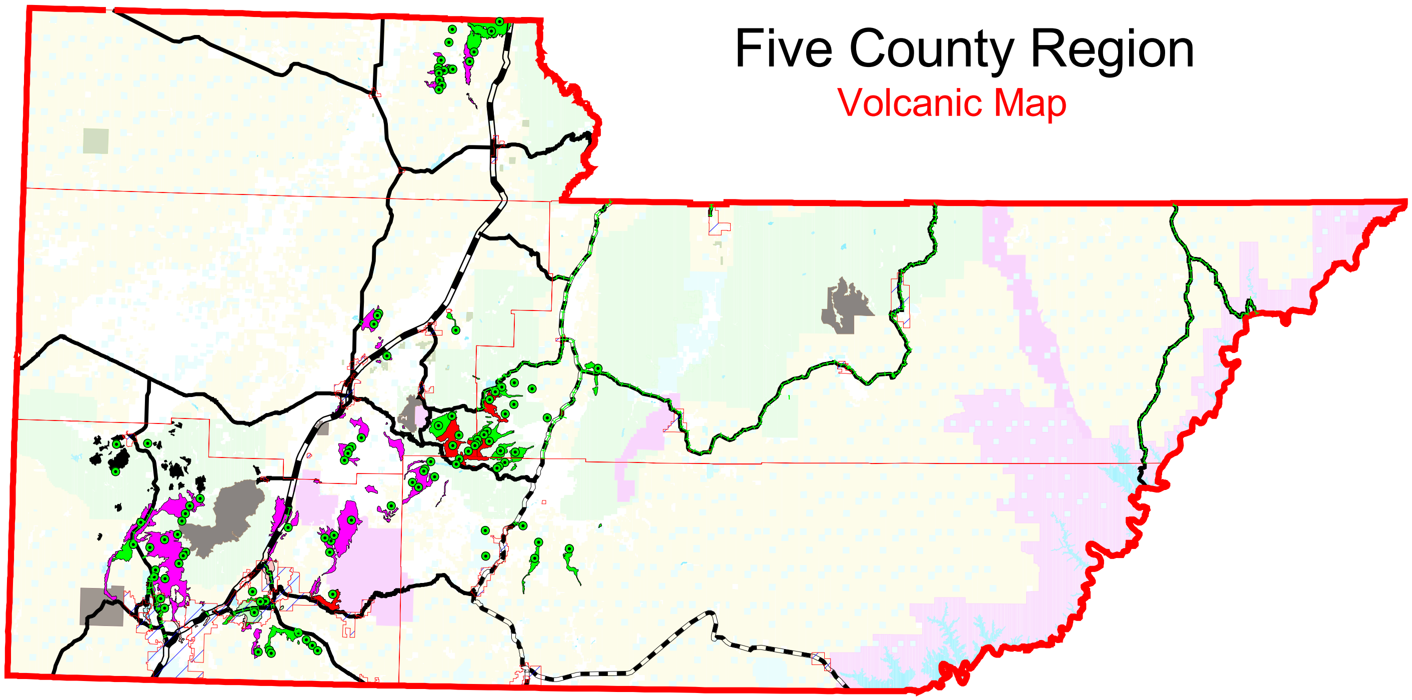
No property damage or human injuries or deaths have been attributed to any type of volcanic activity in southwest Utah since records have been kept.

Portions of the forgoing excerpted from:
Utah Geological Survey Website, 2001, 2002
Nash, 1990, IN: Wood and Kienle, 1990, Volcanoes of the North America: Cambridge University Press
Wood, 1990, IN: Wood and Kienle, 1990, Volcanoes of the North America: Cambridge University Press
U.S. National Park Service Website - Zion National Park, 2000, 2001;
Utah State Parks Website, 2002
Utah.gov Website, 2002, "A Brief History of Utah"
Utah.gov Website, 2002, "Utah History To Go"
Rowley, et.al., 2002 Geologic Map of the Central Marysvale Volcanic Field, Southwestern Utah: USGS Geologic Investigations Series I-2645-A
Lund (ed.), 2002, Field Guide to Geologic Excursions in Southwestern Utah and Adjacent Areas of Arizona and Nevada: U.S. Geological Survey Open-File Report 02-172.

Figure 7

Five County Region

Volcanic Map



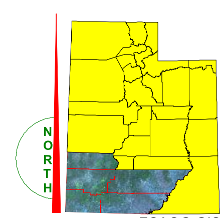
20 0 20 40 60 Miles

Volcanic Flows & Age
1 1 - 30k ya
3 10k - 130k ya
4 10k - 750k ya
5 < 1.65 million ya
Volcanic Flows on Road
Five County Boundary
County Boundaries
Town Boundaries
Volcanic Events
Major Roads
I-15
State Route
US Route
* Note: Administrative Ownership is the background layer

Five County Association of Governments July 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us



Drought

Drought in Utah

Utah has experienced periods of droughts since the pioneers first settled in the Salt Lake Valley. The lengthy droughts of the 1930s and 1950s caused significant economic problems for the state. While the drought of 1976-77 was not as long, the consequences were still intense and costly. The region is currently experiencing its fifth year of drought. The damages from this are yet to be fully comprehended.

Precipitation fluctuates greatly in Utah's relatively arid climate. As the demand for water continues to increase, even temporary shortages in supply can be disruptive to the normal process in urban and rural environments. Two or more consecutive years of significant reduction in precipitation, particularly snowfall in the mountains, may have serious and far-reaching impacts.

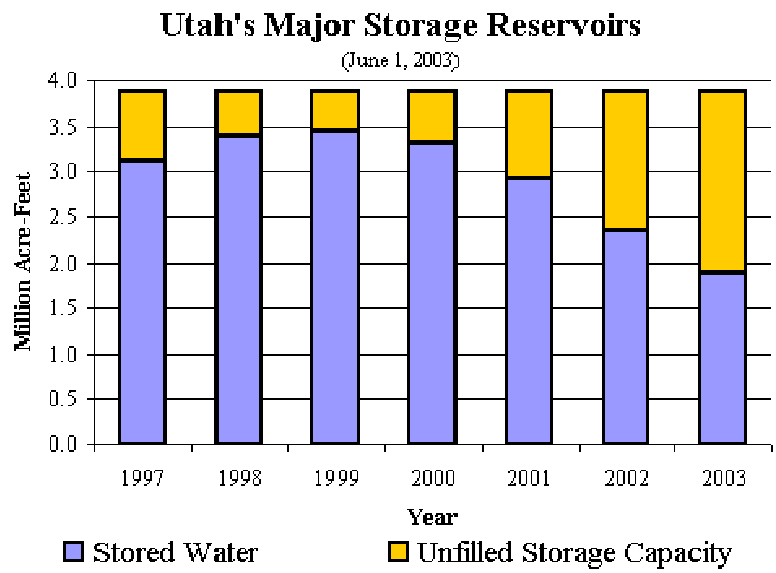
When droughts occur, the state experiences a variety of problems. If identified and evaluated, problems can be dealt with in an organized and cost-efficient manner. The most significant impacts relate to agriculture, municipal water supplies, tourism, and wildlife preservation. Electric power generation and water quality can also be adversely affected.

Impacts of Drought

As drought conditions worsen they create problems for municipal water and sewer systems, primarily from reduction of water supply. The length and degree of intensity of a drought period produces an impact on the state's agricultural industry that has a devastating effect on many farmers and ranchers. Drought creates varying degrees of impact on commerce and tourism within the state. One of the first industries impacted is the ski industry which is highly dependent on early and/or a substantial snowpack. The threat of wildfire in rural and forested areas is a weather-dependent activity that occurs annually. The problem is usually seasonal, but it can and does occur year-round in Utah. Drought conditions, however, increase the severity of wildfire threat and strain normal fire defenses. As drought conditions worsen, there is need to make assessments and identify potential short- and long-range fire protection impacts.

Current Drought Situation

The entire state of Utah is still experiencing drought conditions. For much of the state it is the fifth consecutive year of below normal water precipitation. Throughout April, skies over Utah were cloudy and stormy. However, April 2003's storms were big on show but delivered little water. Average precipitation received at Utah's Snotel sites in April was a disappointing 2.32 inches compared to April's 10-year average of 3.39 inches. Not one of Utah's eleven basins received above average precipitation in April. Storms during the first two weeks of May, however, delivered a whopping 90% of May's 10-year average precipitation. The final two weeks of May were unseasonably hot and dry with record hot days being established around the state. Consequently, total precipitation received at Utah's Snotel sites for May was 2.73 inches compared to a 10-year average of 2.60 inches for May. The remarkably hot days of May's final fortnight have also resulted in a rapid snowmelt and runoff pattern. Statewide snowpack has been reduced to 19% of average. On the positive side, rapid runoff is more efficient at delivering water to reservoirs, as the ground is given less time to soak up the melting water.



Statewide, the total precipitation received at Utah's Snotel sites for this water-year (October 1, 2002 through May 31, 2003) is 78% of average. Much of the state's snowpack, however, is already gone and reservoir storage throughout the state is still well below average. In southern Utah, with very little snowpack left, streamflows have already dropped to about 40% of average. In northern Utah, while some streams are still flowing well, snowpack is disappearing rapidly and it is anticipated that flows will drop off quickly.

Throughout the state, most municipalities and other drinking water providers have taken steps to insure an adequate culinary water supply for future growth and projected water needs. These communities will survive the drought years with few problems. However, some communities, particularly in southern Utah, that rely upon springs or surface water sources could find their supplies marginal or inadequate especially in the late summer months. Typically these communities have imposed some form of outdoor water-use restrictions to reduce water consumption and stretch existing supplies.

Utah's agricultural community is suffering the greatest economic impacts from the drought. The agricultural industry operates with a smaller margin between supply and demand. Consequently, any shortage of agricultural water is keenly felt by agricultural producers. A recent estimate puts this year's statewide agricultural losses at just over $286 million as of April 30, 2003. Consequently, on May 20, 2003 Governor Michael O. Leavitt signed a statewide Declaration of Agricultural Disaster. This Declaration of Agricultural Disaster was the first step in providing the impacted counties with state and federal funding relief, and drought response programs.

Utah’s Long-term Water Supply Outlook
Even in normal years, Utah has a limited water supply. It is reportedly the driest state in the nation. Most of Utah is classified as a desert receiving less than 13 inches of annual precipitation. Fortunately, previous generations of Utahns provided for a sufficient water supply by constructing many water storage reservoirs along with the associated collection, transportation and distribution systems. Federal projects such as the Weber Basin, Central

Utah and Joes Valley, along with local projects funded in part by the Utah Board of Water Resources and the Utah Drinking Water Board, have provided additional water as well as infrastructure replacement.

The Utah Division of Water Resources and the Utah Board of Water Resources have been directed by the Utah Legislature to plan for the future water needs of Utah. An integral part of this process has been the development of a State Water Plan. The overall plan is based on hydrologic river basin plans developed in cooperation with local water users, and local and state government agencies involved in water use and management. The plan identifies resources available, current uses and future demand based on estimates of population growth by the Governor's Office of Planning and Budget. The plan also identifies areas of water quality, instream use and recreation that need to be addressed.

A significant finding of the Utah State Water Plan is that Utahns must become more efficient with the use of existing water supplies. In the residential sector, Utahns have the second highest water use rate in the nation, partly due to the desert environment and developed landscapes dependent on irrigation. We now we face the need to provide for future generations. To do this Governor Leavitt initiated a Statewide Water Conservation Initiative. Not only is the initiative a response to the current drought, it will provide a legacy of intelligent water use for future generations. Water conservation will play a significant role in meeting the water needs of future generations. Utah has set a goal of reducing per capita water usage by 25 percent over the next 50 years.

Drought Response and Mitigation Efforts

Prior to the Governor's formal Drought Emergency Declaration, the State Drought Response Plan was already in operation. The State Drought Review and Reporting Committee has met on a regular basis, since the onset of drought conditions, to be briefed on the statewide drought situation and discuss potential relief actions. With the Governor's formal drought emergency declaration, the Drought Response Committee was activated. This committee meets regularly to discuss drought impacts and coordinate response action.

In response to drought conditions in portions of southern Utah, and as a result of the emergency drought declaration, federal and state funds have been used to drill emergency wells insuring the availability of an adequate water supply for fire suppression and livestock watering. Federal funding has also been used to truck in feed for cattle.

To help reduce the impacts of the drought, state agencies have taken the following actions: The Division of Water Rights is prepared to expedite the well permitting process and approval of temporary water rights for drought-related mitigation. The Board of Water Resources has low and no interest loans and will give priority to projects that address drought related water problems. The State's Community Impact Board has also gone on record to give preferential consideration and priority status to projects that include drought mitigation.

Dissemination of information regarding the drought situation and raising public awareness about the critical nature of Utah's water supply levels has been effective. The state and other water agencies have worked with the local news media (television, newspapers and radio) to keep the general public aware of the drought situation and informed about ways the average citizen can help. Public response and support has been gratifying.

Regional Data

Utah's weather is prone to extremes—from severe flooding to multiyear droughts. Five major floods occurred during 1952, 1965, 1966, 1983, and 1984, and six multiyear droughts occurred during 1896-1905, 1930-36, 1953-65, 1974-78 (U.S. Geological Survey, 1991), and more recently during 1988-93 and 1999-2002. The extent of floods generally is limited in size from one to several watersheds, whereas droughts generally affect most or all of the state. Southern Utah, in particular the Virgin River drainage basin, began experiencing drought conditions during the winter of 1998-99. By 2000, drought conditions were evident throughout all of Utah. The current drought (1999-2002) is comparable in length and magnitude to previous droughts; however, with population growth and increased demand for water in Utah, the general effect is more severe. (USGS 2003)

During 2002, the fourth straight year of nearly statewide drought conditions, some areas of Utah experienced record-low streamflows. Several record-low streamflows occurred in streams with records dating back to the 1900s. The U.S. Geological Survey (USGS) uses streamflow data from eight long-term streamflow-gaging stations for comparison of hydrologic conditions in Utah.

Three of these gages registered new record-low annual streamflows for water year 2002 (October 1, 2001, to September 30, 2002): Colorado River near Cisco, San Juan River near Bluff, and Virgin River at Virgin. At two other gages in eastern Utah, Whiterocks River near Whiterocks and Green River near Green River, 2002 was the second driest year on record. Streamflow in the Upper Colorado River Basin has been so low that the water surface of Lake Powell is predicted to be 80 feet below the fill level by January 2003 (Bureau of Reclamation, 2002). The water level of Lake Powell is currently (2003) low enough near Hite Marina (at the upstream end of the lake) that much of the riverbed of the Colorado and Dirty Devil Rivers is exposed, as are the deltaic sediments that have been deposited since the lake began filling in 1963.

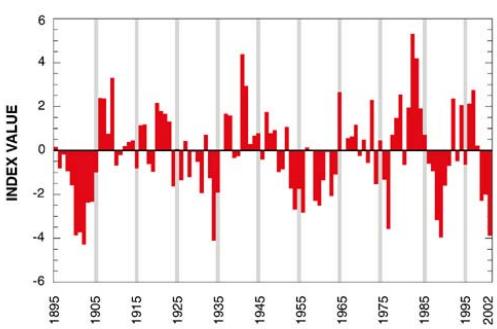
This aerial picture of Lake Powell near Hite, Utah shows the exposed channel of the Colorado and Dirty Devil Rivers, which are normally flooded by the lake, as well as the deltaic sediments that are deposited at the upper end of the lake. This picture was taken in October 2002.

The adjacent states of Colorado, Arizona, and New Mexico also have been experiencing extreme drought conditions and the negative impacts that result. Record-sized forest fires during the summer of 2002 in Arizona and Colorado were directly related to the extremely dry conditions.

Precipitation

Precipitation directly affects streamflow. Under normal precipitation conditions, Utah receives less precipitation than every other state except Nevada. Average annual precipitation at Salt Lake City is about 16.5 inches, and precipitation statewide ranges from about 5 inches on the Great Salt Lake Desert to about 60 inches in the highest mountains (Butler and Marsell, 1972). Three types of moisture-producing weather systems generally account for most precipitation in Utah: Pacific frontal systems, dissipating tropical storms, and summer thunderstorms with moisture originating from the Gulf of Mexico.

Pacific frontal storms generally produce winter mountain snowpack, and the subsequent spring snowmelt increases river flows and reservoir levels. During some winters, high-pressure ridges can dominate over the Western United States and push storm systems northward. These persistent high-pressure ridges result in decreased snowfall in Utah mountain ranges (U.S. Geological Survey, 1991). Mountain snowpacks have generally been below normal statewide since the winter of 1998-99, and Utah has experienced significant reductions in spring runoff since 2000.



Many Federal and State government agencies use the Palmer Drought Severity Index (PDSI) to classify and assess long-term meteorological droughts. The PDSI drought index responds to abnormally wet or dry weather conditions and classifies the conditions on a scale from -6 to 6. On this scale, -4.0 or less signifies extreme drought conditions and 4.0 or more signifies extremely wet conditions. Summarized data from the Utah State University Climate Center in Logan, Utah illustrates the variable nature of precipitation in Utah. On the basis of the PDSI classification scale, the droughts of 1988-93 and 1999-2002 are severe to extreme, but conditions are not as dry as those during 1896-1905.

Streamflow

Data from eight long-term streamflow-gaging stations maintained by the USGS Utah District were used to assess historic and current drought conditions. The stations were selected from a network of more than 150 stations in Utah and are considered index sites because they generally reflect streamflow conditions in their local area. Major dams have regulated flow on the Colorado, Green, and San Juan Rivers upstream from the index sites since the early 1960s. The *Beaver*, *Virgin*, and Weber Rivers are lightly regulated by small headwater reservoirs or power generating facilities. Smiths Fork and the Whiterocks River have small diversions in upper watershed areas but are not regulated upstream from the gages. Despite these modifications to the drainages, these index sites are considered to generally reflect hydrologic conditions in their respective watersheds, including snowpack and the amount of water stored in reservoirs.

Historic Streamflow Data

A chronology of significant floods and droughts in Utah from 1884 to 2002 and a summary of their effects on infrastructure, population, and the environment is presented below in Table 10 (USGS 2003). Prior to current drought conditions, Utah experienced drought on a regional scale most recently in the late 1980s to early 1990s. Other major droughts occurred during 1896-1905, 1930-36, 1953-65, and 1974-78. The average length of these droughts is about 5 years and they recur about every 10 to 20 years.

Table 10 Chronology of Floods & Droughts

Flood or Drought	Date	Area affected	Remarks
Flood	July 4, 1884	Colorado River	Probably snowmelt combined with rainfall.
Drought	1896-1907	Statewide	Regional.
Flood	Aug. 13, 1923	Tributaries to Great Salt Lake between Ogden and Salt Lake City	Locally intense thunderstorms. Deaths, 7; damage, $300,000.
Drought	1930-36	Statewide	Regional.
Flood	Apr. 28-June 11, 1952	Strawberry, upper Price, upper San Rafael, Ogden, Weber, Provo, and Jordan Rivers; Blacksmith and Spanish Fork; upper Muddy and Chalk Creeks	Melting of snowpack having maximum-of-record water content for Apr. 1. Disaster declared. Deaths, 2; damage, $8.4 million.
Drought	1953-65	Statewide	Regional.
Flood	June 16,	Duchesne River	Dam failure.

	1963		
Flood	June 10-11, 1965	Ashley Creek and other streams between Manila and Vernal, and west of Manila	Three days of intense rainfall on thick snowpack above altitude of 9,200 feet. Deaths, 7; damage, $814,000.
Flood	Dec. 6-7, 1966	***Virgin and Santa Clara Rivers***	Four days of light to intense rainfall of as much as 12 inches. Damage, $1.4 million.
Flood	Aug. 1-2, 1968	Cottonwood Wash and other nearby tributaries to San Juan River	Locally intense thunderstorms following 11 days of rainfall. Damage, $34,000.
Flood	Sept. 5-7, 1970	San Juan River and tributaries from McElmo Creek to Chinle Creek	Record-breaking rainfall. Deaths, 2; damage, $700,000.
Flood	Aug. 27, 1972	Vernon Creek	Locally intense thunderstorms.
Drought	1974-78	Statewide	Regional.
Flood	Apr. 10-June 25, 1983	Lower Duchesne and Jordan Rivers and tributaries (including Spanish Fork); upper Price, Bear, Sevier, and San Pitch Rivers; Chalk, East Canyon, Trout, and George Creeks; Great Salt Lake and tributaries between Ogden and Salt Lake City	Rapid melting of snowpack having maximum-of-record water content for June 1. Result of large El Niño event. Disaster declared by President. Damage, $621 million.
Flood	Apr. 17-June 20, 1984	White, upper Price, and Fremont Rivers; lower Bear and Sevier Rivers and tributaries; Beaver River; Red Butte Creek; Spanish Fork; Jordan River	Runoff from greater-than-average snowpack for Apr. 1 and spring precipitation. Result of large El Niño event.
Flood	May 22, 1984	Sevier Lake	Runoff in Sevier River from Nov. 1982 through June 1984 exceeded upstream reservoir capacity; about 1.5 million acre-feet of water conveyed to Sevier Lake. On May 22, 1984, lake reported to be as deep as 35 feet after being dry or nearly dry since about 1880.
Flood	June 15, 1984	Utah Lake	Runoff from greater-than-normal precipitation since Sept. 1982 increased lake level to 101-year record of 5.46 feet above

			compromise level on June 15, 1984. Mainly a result of large El Niño event of 1983-84. Damage, $5.9 million.
Flood	June 3, 1986	Great Salt Lake	High runoff from greater-than-normal precipitation since Sept., 1982 increased lake level to 140-year record altitude of 4,211.85 feet on June 3, 1986. Partially a result of large El Niño event of 1983-84. Damage, $268 million.
Flood	June 7, 1986	Provo River	Trial Lake dam failure. Slope-area measurement.
Drought	1988-93	Statewide	Regional.
Flood	Jan. 1, 1989	***Quail Creek, lower Virgin River***	Quail Creek Reservoir dike failed on Jan. 1, 1989, releasing about 25,000 acre-feet of water to the Virgin River near Hurricane. Damage, $12 million.
Flood	Feb.-Mar. 1995	***Santa Clara River***	
Flood	May 1997	South Fork Ogden River, Logan River, Blacksmith Fork	Greater-than-normal snowpack in the Bear and Weber River drainage basins caused minor flooding. Minor damage occurred to cabins and campgrounds in the area.
Drought	1999-present	Statewide	Regional.

The lowest total annual flow on record at the Colorado River near Cisco, San Juan River near Bluff, and *Virgin River* at *Virgin* stations occurred during 2002, as did the second lowest total annual flow on record at the Whiterocks River and Green River stations. The 2002 drought was not as severe at the northern stations; however, 2002 was still one of the 10 driest years on record for Smiths Fork and the Weber and Beaver Rivers.

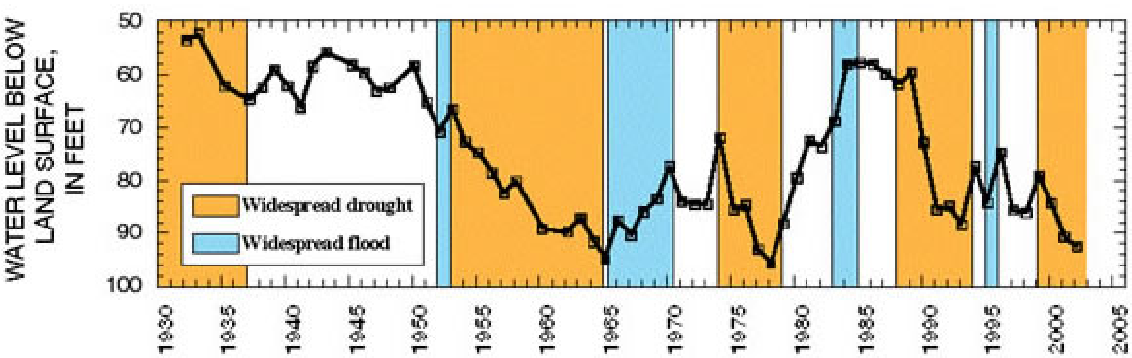
Effects of Drought on Selected Reservoirs

The compounded effects of 4 years of less-than-normal precipitation include lowered water levels of most major reservoirs in Utah. Releases from dams on these reservoirs have been, and most likely will continue to be, the minimum releases required for downstream water users. According to the Bureau of Reclamation, unregulated inflow to Lake Powell during water year 2002 was only 3.06 million acre-feet, or 25 percent of the 30-year average, which is the least amount of inflow to Lake Powell since the completion of Glen Canyon Dam in 1963 (Bureau of Reclamation, 2002).

Effects on Ground Water
Prolonged droughts have a primary and secondary effect on ground-water resources. First, decreased precipitation leads to decreased recharge to aquifers. Second, decreased surface-water resources generally lead to increased ground-water withdrawals, as well as to increased requests for water-well construction permits (Gates and Allen, 1996).

Aquifers in arid to semiarid regions are typically recharged from higher-altitude areas that receive more precipitation. Decreased precipitation and snowpack runoff in these areas leads to a decrease in aquifer recharge. In addition, dry conditions deplete soil moisture. This moisture needs to be replaced before recharge conditions can return to normal. Aquifers also can be recharged by seepage from lakes and streams. As these surface-water sources of recharge dry up during a drought, recharge to aquifers is again decreased.

As surface-water sources diminish during a drought, irrigators and public-supply systems withdraw more ground water. During the droughts of 1974-77 and 1988-93, the number of well permits granted rose sharply (Gates and Allen, 1996). This increased demand for ground water increased the stress on an already depleted aquifer. In general, ground-water levels in Utah have declined during the current drought years (Burden and others, 2002). The correlation between droughts and low water levels is shown in a well in Cedar Valley, near Cedar City, Utah.



Lower ground-water levels are the result of both decreased recharge and increased withdrawals; however, it is difficult to determine which causes the greater effect.

Summary and Conclusions
Utah has experienced drought conditions statewide for the past 4 water years, and in the southern part of the state for the past 5 water years. In general, drought has been more severe in the southern parts of Utah. Total annual flow during water year 2002 at the Colorado River near Cisco, Green River near Green River, Vir*gin River near Virgin*, and the San Juan River near Bluff, was the lowest recorded during approximately the past 100 years of record. During water year 2002, streamflow conditions at streamflow-gaging stations in southern Utah showed little to no effect from spring runoff and approached or exceeded the historic minimum flows. Decreased flow from major rivers in Utah has led to a decline in most reservoir levels and in the Great Salt Lake. Drought conditions in Utah are common and normally last an average of about 4 years. The current drought is not unusual for its length but rather for its severity, as water year 2002 will be recorded as one of the driest years on record for many parts of Utah. (Portions excerpted from USGS Fact Sheet 037–03)

Vulnerability Assessment

Overall Summary of Impacts

FEMA Hazard Profile for Drought

Frequency: Likely (drought patterns are cyclical)
Severity: Moderate to Severe throughout the five counties.
Duration: 4 year cycles are the norm

Current Drought Related Water Supply Conditions in Select Southwestern Utah Areas

Cedar/Beaver Basin

The water table dropped significantly last year-especially in the Cedar Valley. Cedar City is lowering all its pumps 50 ft. There was virtually no recharge last year to the aquifer, and it is declining faster than it usually does. Farmers and other private wells in the Cedar Valley west of Enoch saw their water levels drop sixty feet last year.

The National Weather Service has predicted the April to July runoff from Coal Creek to be only 40% of normal, and about 50 to 60% of normal on the Beaver River. Minersville Reservoir has less water than last year, Upper Enterprise Reservoir is a puddle, and Lower Enterprise Reservoir will empty this year by August. The precipitation reported from Snotel sites for the basin looks better than last year, but is still lower than the average.

The communities in this basin get the majority of their water from wells and the rest from springs. The cities are confidant their culinary supplies will last through the summer, but many will continue to restrict outdoor water use during the day.

Beaver City Water System - Beaver County

Beaver City is supplied by three culinary wells. The secondary system, that services approximately 95% of city, is supplied from the Beaver River. When river water is in short supply, the secondary system is supplemented with water from a culinary well. Last year the secondary system was supplemented for only three or four days. This year the river has much more water and reservoirs upstream (Kent's Lake and Three Creeks Reservoir) have filled substantially more than last year. Watering restrictions are currently voluntary but may become mandatory by the first of August. Present voluntary measure is time of day watering, restricted from 10:00 a.m. to 6:00 p.m. In August the city may implement twice-a-week watering restrictions as well.

Brian Head - Iron County

Brian Head's springs, which declined last year to a low of 16 gpm, are currently at peaking at (150 gpm). Low flows generally occur December through March. The city is selling bulk water to summer cabins at present, but will watch the level of the springs and may have to stop later in the summer. The area had 75% avg. snow-pack but the water content is higher than the past few years. The town currently does not allow watering between 10:00 a.m. and 6 p.m.

Cedar City - Iron County

Cedar City is supplied by seven culinary wells, which were lowered 50 feet last year due to declining ground water levels. The ground water surface is still much higher than the bottom depth of the wells. Of greater concern is that system is at 85 to 90% of capacity. They will be drilling an additional culinary well and irrigation well this year to supplement capacity. They will also look at replacing a troublesome shallower culinary well. Springs were running about 50% in April, and are currently running at about 80% of normal due to late season precipitation.

Enoch City - Iron County
City wells dropped 30 feet last year and farm wells in the valley dropped 50 feet. This year there has been no drop so far. On May 1st a new rate structure went into effect with six pricing levels dependant upon usage. Citizens are generally more supportive of conservation measures now due to media messages and experiencing of dry conditions. The city is served by five culinary wells and currently has no secondary system. The city is also installing a demonstration garden with help from USU extension agents. The 1.5-acre landscape is located at the city offices and will feature 8 different low-water use hybrid turf grasses (three hot seasons and five cool seasons) distributed in 24 example garden spots.

Enterprise - Washington County
All customers use culinary well water for both indoor and outdoor use. They do not anticipate any problems this year.

Milford - Beaver County
The flow-rate on city wells is down very slightly. Two culinary and two irrigation wells currently serve the city. The irrigation wells supply only city recreation areas and schools, no residential secondary water system. Should have no problems with the water supply. Farmers nearby pumping from a different aquifer have experienced some ground water declines, but no shortages reported.

Parowan - Iron County
Parowan has two culinary wells. One is used approximately four hours per day and the other serves as a back up which has never been used. The city has just finished installing a second 1,000,000 gallon tank at the south end of town that will increase storage and improve service to the area. Culinary well supplies look good with no expected problems. Irrigation supplies are dependant upon the limited storage in Yankee Meadows Reservoir and wells located up the canyon, which produce 600 gpm during normal years. Parowan City water serves 2,500 residents.

Paragonah - Iron County
This town of approximately 500 is served by one spring. The town has first priority water rights from the spring, which is currently flowing at 200 gpm, 50% of normal. Other wells in the area are also experiencing declining water levels. Some had to lower pumps as much as 40 feet last year to stay ahead of the decline. Irrigation water from Red Creek Reservoir will supply 500 acre-feet or 60% of normal. Irrigation water from the reservoir started being released on June 17. City is considering a time of day watering ordinance and other restrictions.

Agricultural Related Effects in the Cedar/Beaver Basin

Beaver River - Beaver County
Thus far the Beaver River is flowing twice as much water as last year. The river peaked at 250 cfs June 10, but fell off to 54 cfs by June 17. When the river flow drops below 30 cfs, the city will supplement the secondary system with ground water. The city is divided into two sections for irrigation, with three days each for watering. The seventh day is for the city

parks. Minersville Reservoir (downstream from the city) is around 30% of normal storage for this time of year. Reservoirs upstream of the city, Kent's lake (60% full, 800 acre-feet) and Three Creeks (with 2,220 ac-ft) have much more water in them than last year.

Coal Creek - Iron County
Coal creek flows are currently lower than normal but much improved over last year. Peak flows occurred in mid May this year vs. mid April last year. Farmers are expecting a normal crop year. All seven irrigation companies have had some water, and three irrigation companies have water at present. Last year two companies did not get any water. Nearby well levels appear to be holding steady at present.

Enterprise Area - Washington County
Upper Enterprise is empty, lower Enterprise has 450 to 500 acre-feet stored. This will allow a supply of .3 to .4 acre-feet per ten shares. This amount should last through August. Normal allotment is 3 acre-feet per ten shares. At the end of last summer the remaining ponds in both reservoirs were poisoned to remove "shiner" fish. The Utah Fish and Wildlife Division has given up reserves in both reservoirs this year as there will not be enough water to support planting of fish.

Milford Area
Most farmers do not report any problems pumping water, although some have had to lower their wells. No water problems reported at Circle Four farms.

Minersville - Beaver County
Minersville irrigation will end up with about 7300 acre-feet, (water rights of 7,500 acre-feet). They are issuing ½ acre-feet per share in order to conserve water, as evaporation losses will consume a good portion of their storage. There will be no water for Rocky Ford Irrigation Company and possibly none for the wildlife pool. On June 17, the reservoir storage was 4,663 acre-feet of 26,500 acre-feet capacity, (18% full).

Parowan Valley - Iron County
The irrigation water in the valley is supplied from ground water, springs, canals and some small reservoirs. Some of the farmers had to lower their pumps last year - up to 20 feet. The area has had more storm water to help crops this spring, but the storage levels are lower than last year. It will be another short season for irrigators without wells.

Kanab Creek-Virgin River Basin
Despite below average precipitation throughout the year, the water supply in the Virgin/Kanab Creek Basin looks better than it did last year. At one stream gage on the Virgin River, the principal source of water for much of the population in the basin, 31% more water has been measured this year than last (see attached chart). Regarding reservoir storage, this is the first year that Sand Hollow reservoir has been used and the addition of this new reservoir nearly doubles the storage capacity on the system. This will obviously be a boon for the area, although this year, there has not been sufficient excess to fill the reservoir.

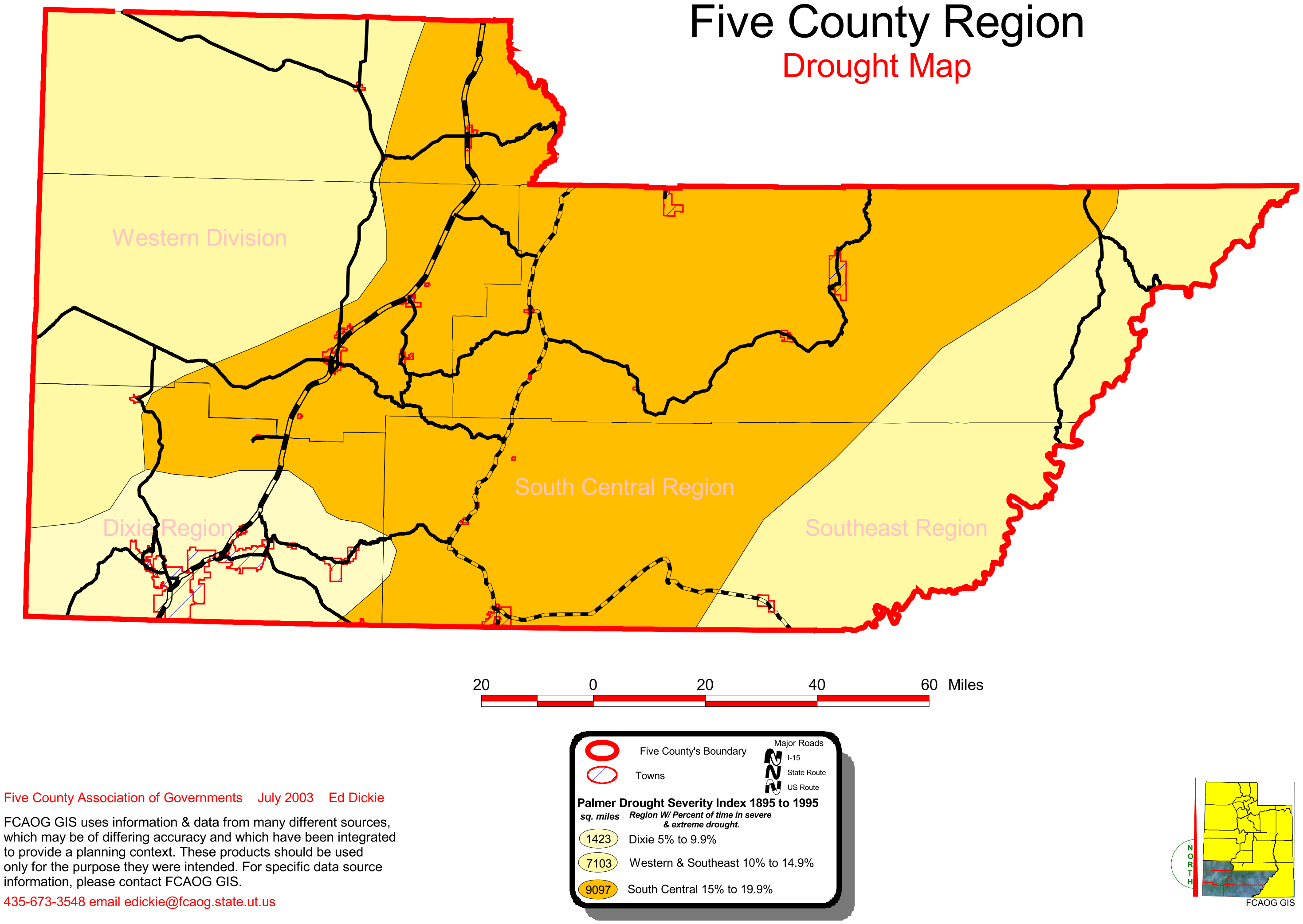
Municipal and Industrial Water Users
Drinking water supplies are holding up well and there is a general expectation that the municipal water supply will suffice to meet the demands. This expectation has been reinforced by the addition of several new wells throughout the basin, most of which are deep wells. In addition to the new sources of water, every community in the basin has a growing

conservation ethic. Most cities have implemented conservation ordinances. Some success has already been reported, for example, reports from St George are that compared with last year at this time, the residents have consumed 16% less water.

Although, in general, the outlook is hopeful for the basin, there are a few areas that will undoubtedly be in tough circumstances. Private water companies relying on shallow wells in the Cedar Mountain area will probably be out of water before the end of summer and have to truck water from Kanab as they did last year. Also, Gunlock reservoir is nearly at its conservation pool level, meaning that no more water will be able to be released. This has direct impact on agricultural irrigators who will have their last watering turn of the year this week, as well as residential users who rely on this water to irrigate their landscapes through the secondary irrigation system. The western half of St George as well as the city of Santa Clara are among those so impacted.

Five County Region

Drought Map



Five County Association of Governments July 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Problem Soils

Soil Problems in Southwestern Utah

Soil- and rock-related engineering geologic problems occur in a variety of geologic settings and are some of the most widespread and costly geologic hazards. Six types of problem soil and rock are present in southwestern Utah. The most extensive are expansive soil and rock. The majority of expansive soil problems are related to bentonitic marine shales near St. George.

Subsidence of the ground surface due to collapsible soil has caused extensive damage in and around Cedar City. Collapsible soil is common in Holocene alluvial-fan and debris-flow deposits in southwestern Utah. Soil and rock containing gypsum are also susceptible to subsidence. Ground water and introduced waters from irrigation dissolve gypsum causing subsidence.

Limestone susceptible to dissolution and subsidence occurs throughout mountains west of Sevier Lake, west of Richfield, and south of St. George. No known damage to structures has occurred from ground collapse or subsidence related to limestone karst, but because karst ground-water systems have little filtering capacity, contamination of ground water is a major concern. Piping is a common problem in fine-grained Holocene alluvium incised by streams in much of southwestern Utah. Collapse of soil pipes and subsequent erosion has damaged roads and agricultural land.

Sand dunes occur in the Escalante Desert and west of Kanab. Migration of dunes across roads and burial of structures are common problems in areas where active dunes are present.

Geologic materials with characteristics that make them susceptible to volumetric changes, collapse, subsidence, or other engineering-geologic problems are referred to as problem soil and rock. Geologic and climatic conditions in southwestern Utah provide a variety of both localized and widespread occurrences of these materials.

Six types of problem soil and rock are found in southwestern Utah: (1) expansive soil and rock with high shrink/swell potential, (2) collapsible soil, (3) gypsum and gypsiferous soil susceptible to dissolution, (4) limestone susceptible to dissolution under some hydrogeologic conditions, (5) soil subject to piping (localized subsurface erosion), and (6) active dunes. Some materials, such as expansive soil and limestone, cover large areas, whereas others, like active dunes, are of limited extent.

Geology and climate are the main factors which influence the distribution of problem soil and rock. The geologic parent material largely determines the type of problem present. For example, expansive soil is most often associated with shale, and karst dissolution features form in limestone and gypsiferous formations. Weathering and erosion are controlled by local and regional climate. A prime example of the influence of climate is collapsible soils, which are common in arid southwestern Utah, but much less common in wetter northern Utah.

Expansive Soil and Rock
Expansive soil and rock are the most common type of problem deposit in southwestern Utah. In particular, the Jurassic-age Arapien and Cretaceous-age Tropic Shales, and the Triassic-age Chinle and Moenkopi Formations are sources for expansive materials. Expansive deposits contain clay minerals that expand and contract with changes in moisture content. Clays absorb water when wetted, causing the soil or rock to expand. Conversely, as the material dries, the loss of water between clay crystals or grains causes the deposit to shrink. The most common clay mineral associated with expansive deposits in Utah is montmorillonite. Certain types of montmorillonite can swell to 2,000 times their original dry volume.

Expansive deposits are extensive around St. George, Washington, and Santa Clara. In these areas expansive clays in the Chinle Formation have been most damaging to structures. In Santa Clara, many homes and a church were damaged by expansive clays in the Chinle Formation. Common problems are cracked foundations, heaving and cracking of floor slabs and walls, and failure of wastewater disposal systems. Sidewalks and roads are particularly susceptible to damage.

Collapsible Soil
The phenomenon of hydrocompaction, which causes subsidence in collapse-prone soil, occurs in loose, dry, low density deposits that decrease in volume or collapse when saturated for the first time following deposition. Collapse occurs when susceptible soils are wetted to a depth below that normally reached by rainfall, destroying the clay-bonds between grains. Collapsible soil is present in geologically young materials such as Holocene-age alluvial-fan and debris-flow sediments, and in some windblown silts. These deposits have a loose "honeycomb" structure and high dry strength, resulting from rapid deposition and drying. When saturated, the honeycomb structure collapses and the ground surface subsides, damaging property and structures. Human activities that involve some form of water application such as irrigation, water impoundment, lawn watering, alterations to natural drainage, or wastewater disposal commonly initiate hydrocompaction.

Alluvial fans containing fine-grained deposits derived from shales, mudstones, and volcanic rocks are the most common sites for collapsible soil. Collapsible soil is present particularly near Cedar City and the Hurricane Cliffs. In Cedar City approximately $3 million in damage to public and private structures has been attributed to collapsible soil. Other areas in southwestern Utah with a potential collapsible soil problem are along mountain fronts where young alluvial-fan deposits containing fine-grained sediments are present. Climate also plays a role in the distribution of collapsible soils. Drier areas, such as the Basin and Range and Colorado Plateau provinces, provide the best conditions for development of collapsible soil.

Gypsiferous Soil and Rock
Gypsiferous deposits are subject to settlement caused by the dissolution of gypsum, which creates a loss of internal structure and volume within the deposit. Gypsum is a primary component in some rocks and the soils derived from these rocks. Gypsum in soil can also form in other ways - including as a secondary mineral deposit leached from surficial layers and concentrated lower in the soil profile or wind-blown dust, and in the St. George area by the evaporation of ground water. The most common sources for airborne gypsum are playas, on which crusts of gypsum salts form as the wetted playa surface dries during the warmer months of the year.

Gypsiferous soil and rock deposits are common in southwestern Utah, particularly along the base of the Hurricane Cliffs. Much of the gypsum is derived from erosion of gypsum-rich rock units such as the Shnabkaib Member of the Moenkopi Formation, the Carmel Formation, and the Arapien Shale. Gypsum in these deposits can cause damage to foundations, and induce land subsidence and sinkholes similar to those seen in limestone terrain. Water introduced into the subsurface for irrigation and landscaping or into wastewater-disposal systems, can cause underground solution cavities to develop, which may ultimately cause surface collapse. Gypsum is also a weak material with low bearing strength, which can cause problems when loaded with the weight of a structure. In addition, gypsum dissolved in water forms sulfuric acid and sulphate, which react with certain types of cement and weaken foundations.

Limestone and Karst Terrain

Karst terrain is characterized by closed depressions (sinkholes), caverns, and streams that abruptly disappear underground. Karst features are caused by ground and surface-water dissolution of calcareous rocks, such as limestone and dolomite. In southwestern Utah, the units most susceptible to dissolution are the Ochre Mountain, Joana, Flagstaff, and Kaibab Limestones, and the Laketown Dolomite and Notch Peak Formation. These units are found near Richfield, St. George. Fractures within the rock, frost shattering, and stream erosion also aid in the development of karst terrain.

Karst features directly affect both surface and subsurface drainage. The cavernous nature of karst terrain provides avenues for contaminants from surface or subsurface sources, such as wastewater-disposal systems, landfills, and buried gasoline tanks, to enter the ground-water system. Contaminants can spread rapidly due to the interconnected system of conduits. Cavernous subterranean openings in karst terrain often collapse, leaving sinkholes at the surface. Structures in the area may be damaged by the collapse. Although no documented occurrence of damage due to collapse has occurred in southwestern Utah, the potential for damage exists where susceptible units are present.

Most karst terrain in southwestern Utah is relict and relates to moister climates during the Pleistocene, or may have been created by ground water prior to the rock being uplifted and tilted during basin and range faulting. Under present climatic conditions, the potential for continued karst development in southwestern Utah is low, except in areas where sufficient ground water is present to cause solution weathering of limestone and dolomite.

Soils Subject to Piping

Piping is subsurface erosion by ground water that moves along permeable, noncohesive layers in unconsolidated materials and exits at a free face, usually along a stream bank or cliff that intersects the layer. Removal of fine-grained particles (silt and clay) by this process creates voids within the material that act as minute channels which direct the movement of water. As channels enlarge, water moving through the conduit increases velocity and removes more material, forming a "pipe." The pipe becomes a preferred avenue for ground-water drainage and enlarges as more water is intercepted. Increasing the size of the pipe removes support from the walls and roof, causing eventual collapse. Collapse features form at the surface above the pipes, directing even more surface water into the pipes. Eventually, continued collapse forms a gully that concentrates erosion along the line of collapse features.

Deposits susceptible to piping are common in the southwestern part of the state. Types of material susceptible to piping include fine-grained alluvium; weakly cemented, fine-grained rock (siltstone, mudstone, and claystone), and volcanic tuff and ash. Holocene-age alluvial fill in canyon bottoms is the most common material susceptible to piping in Utah.

Piping can cause damage to roads, bridges, culverts, and any structure built over soils subject to piping. In areas where piping is common, roads are frequently damaged where they parallel stream drainages and cross-cut pipes. Road construction can contribute to the piping problem by disturbing natural runoff and concentrating water along paved surfaces, allowing greater infiltration and potential for pipes to develop. Earthfill structures such as dams may also be susceptible to piping.

Sand Dunes

Dunes are common surficial deposits in arid areas where sand derived from weathering of rock or unconsolidated deposits is blown by the wind into mounds or ridges. Dunes form downwind of source areas which may contribute a variety of different types of wind-blown material.

In areas where development encroaches on dunes, inactive or vegetated dunes may be reactivated, allowing them to migrate over roads and bury structures. Another problem is the contamination of local ground water from wastewater disposal in dunes. The uniform size of the sand grains comprising dunes makes them highly permeable. The fine sand in dunes can also clog wastewater-disposal systems. Gypsiferous dunes are an especially poor wastewater-disposal medium because they dissolve when wetted.

Dune fields are present in many areas of southwestern Utah, especially in the Escalante Desert and west of Kanab. Avoidance of dunes is the best way to prevent damage to structures. However, active dunes usually are a maintenance problem only and do not preclude development.

Conclusions

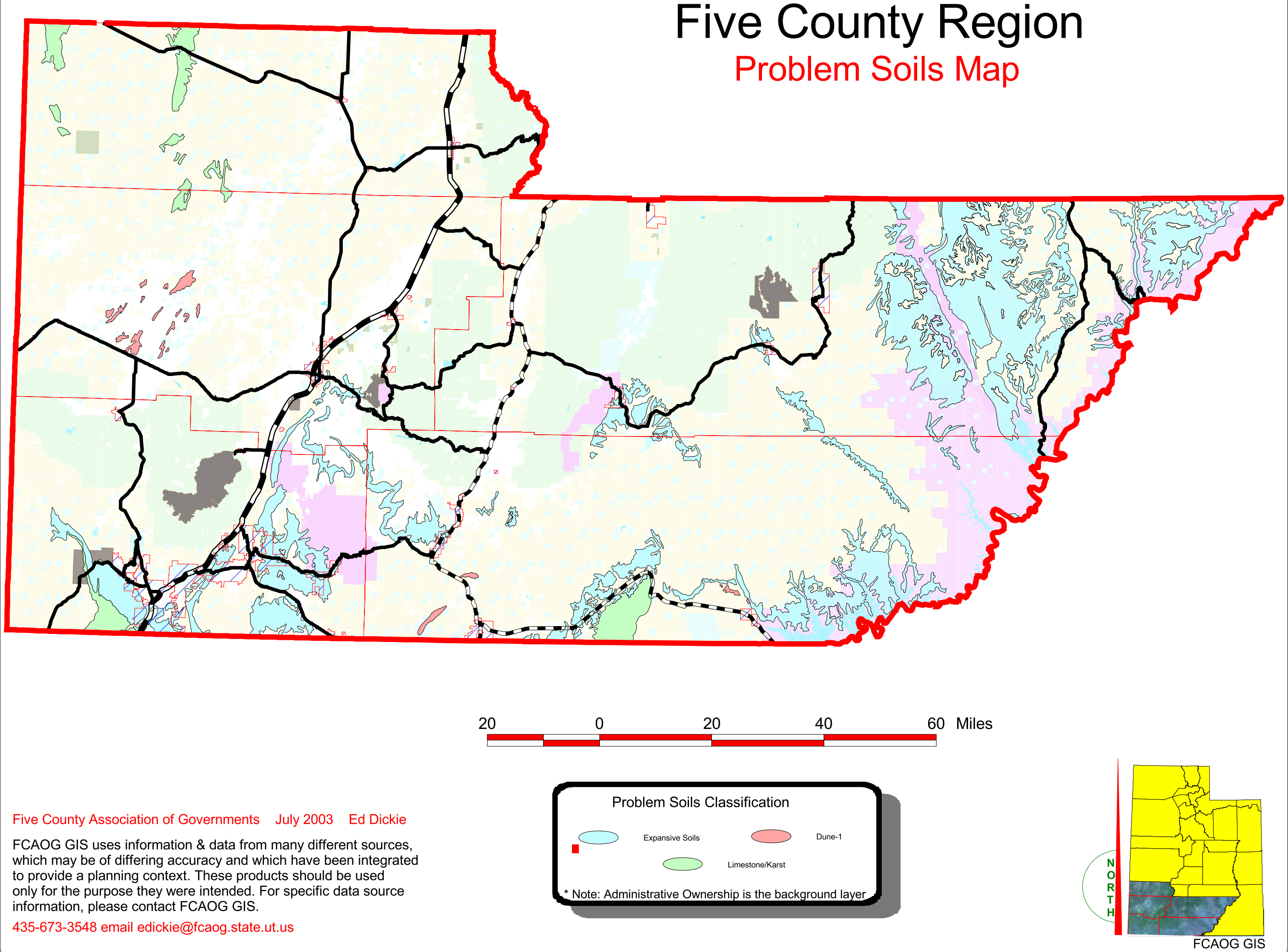
Humans have no influence on the distribution of problem soil and rock, but their activities are often adversely affected by them. As a result, urbanized areas of southwestern Utah are susceptible to damage from these deposits. As development encroaches on less suitable terrain, damage from problem soil and rock has, and will increase. Detailed geotechnical studies are needed in areas of problem soil and rock to identify and mitigate potential problems, and avoid costly corrective measures. Six types of problem soil and rock are present in southwestern Utah. Expansive soil and rock is the most extensive. Most expansive soil problems are related to bentonitic shales near St. George.

Collapsible soil has caused extensive damage in and around Cedar City. Holocene alluvial-fan and debris-flow deposits are the sources of collapsible soil in southwestern Utah. Soil and rock containing gypsum are also susceptible to subsidence. Ground water and introduced waters from irrigation dissolve gypsum causing subsidence.

Limestone susceptible to dissolution and subsidence occurs south of St. George. Structures have not been damaged by ground collapse or subsidence related to limestone karst, but because karst ground-water systems have little filtering capacity, contamination of ground water is a major concern. In fine-grained Holocene incised by streams piping is a common problem. Collapse of soil pipes and subsequent erosion has damaged roads and agricultural land. Sand dunes in the Escalante Desert and west of Kanab can migrate across roads and bury structures in areas where active dunes are present. (Excerpted from Lund, UGS unpublished information)

Five County Region

Problem Soils Map



Five County Association of Governments July 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Severe Weather

FEMA Hazard Profile

Frequency: Likely
Severity: Minimal to Severe. Effects range from extreme to individual structures to moderate to many structures.
Duration: Short term, i.e. tornadoes or windstorms, to several days or more, i.e. severe snowstorms.

Tornadoes

There were 114 tornadoes reported in the State of Utah during the period between 1950 and 2002. The distribution of the twelve tornadoes reported to have occurred in the five southwestern counties of Utah during the same period 1950 through 2002 are detailed in Table 11 below:

Table 11 Number of Reported Tornadoes in the Southwestern District

Location	Number of Tornadoes Reported (1950-2002)	Percentage of Total Tornadoes Reported in State (1950-2002)
Beaver County	4	3.5%
Garfield County	1	0.9%
Iron County	5	4.4%
Kane County	0	0%
Washington County	2	1.8%
Region (all five combined)	12	10.5%

On August 11, 1999, an F2 tornado touched down in the metropolitan area of Salt Lake City. The tornado lasted ten minutes and killed one person, injured more than 80 people, and caused more than $170 million in damages. It was the most destructive tornado in Utah's history, and awakened the entire state's population to the fact that the Beehive State does experience tornadoes.

In the period between 1950 and 2002 there have been a number of injuries reported from Tornadoes statewide:

1 male on August 14, 1968
1 female on April 19, 1970
2 people on July 8, 1989
1 male on April 23, 1990
2 people on June 2, 1993
1 female on May 29, 1996
5 people (or more) on August 20, 1998
80 people (or more) on August 11, 1999
1 female on September 3, 1999

During the same period there was one reported death resulting directly from a tornado which occurred on August 11, 1999 in Salt Lake City. It should be noted that the only other reported death, the first since settlement of the area by Mormon Pioneers was the death on July 6, 1884 of a seven year-old girl, named Kitty Wells, who was killed by a tornado while camping with her family in an area about 23 miles east of Wanship, in Summit County. There have been no reported tornadoes in Kane County and no deaths from tornadoes in Beaver, Garfield, Iron or Washington counties.

Anecdotal information is available for ten of the twelve above listed tornadoes that have occurred in the five county region:

Tornado, Kanarraville, Iron County
July 14, 1953, 1700 MST, 37 30'N, 113 15'W
A small twister hit the town of Kanarraville, Iron County. It broke limbs off trees and tore off the metal roof of a garage. It lasted ten minutes. (The day and hour of this tornado is estimated from cloudburst data and other severe weather activity in southwestern Utah.)

Tornado, northwest of Bryce Canyon, Iron County
June 16, 1967, 1400 MST, 38 00'N, 112 30'W
An airplane pilot observed a tornado about 25 to 30 miles northwest of Bryce Canyon, in Iron County. It occurred in open country and caused no reported damage.

Tornado, northeast of Milford, Beaver County
March 29, 1982, 1214 MST, 38 30'N, 112 53'W
A white tornado was observed 16 miles northeast of Milford, Beaver County, by the official weather observer at Milford. It was on the ground about three minutes. It churned up the snow covered ground and did no damage in that remote area. It moved in a northeasterly direction.

Tornado, Beryl Junction, Iron County and Washington County
May 30, 1986, 1730 MST, 37 40'N, 113 39'W
A tornado was reported by an official weather observer near Beryl Junction, Iron County. It traveled 3.5 miles and was 200 yards wide. The associated thunderstorm winds split several trees that downed power lines which in turn caused a grass fire. The tornado crossed into the northern portion of Washington County.

Tornado, east of Beaver, Beaver County
September 7, 1991, 1530 MST, 38 17'N, 112 32'W
A 30-foot wide tornado was spotted by two people. The funnel cloud lasted five to ten minutes but only touched down briefly. Since this tornado occurred in open country, it caused no damage.

Tornado, west of Beaver, Beaver County
May 21, 1992, 1115 West, 38 17'N, 112 51'W
A 45-foot wide tornado was spotted about 10 miles west of Beaver by a person driving south on I-15. After the person spotted the tornado, it lifted back into the clouds within a minute. Therefore, the total amount of time the tornado was on the ground is unknown. The tornado occurred in open country, and caused no damage.

Tornado, near St. George, Washington County
August 31, 1992, 1310 MST, 37 00'N, 113 28'W
Thunderstorms that had developed over the southwest portion of Utah produced a tornado ten miles southeast of St. George. A pilot spotted this tornado, which was about 20 yards wide and only remained on the ground for a brief period of time.

Tornado, Newcastle, Iron County
July 23, 1998, 1015 MST, 37 39'N, 113 32'W
On July 23, 1998, a tornado was observed by several people just southeast of Newcastle in Iron County. The tornado occurred between 11:15-11:25 AM, briefly touching down for a few minutes just off of State Route 56.

Tornado, 10 miles NW of Panguitch, Iron County
September 8, 2000, 1200 MST, 37 58'N, 112 28'W
At about 1:00 pm a tornado was spotted just outside of Panguitch on Highway 20 which connects US 89 to I-15. It was reported on the ground for at least five minutes in open country. No damage was reported.

Tornado, 6 miles SW of Milford, Beaver County
September 4, 2001, 1315 MST, 38 23'N, 113 00'W
A weak tornado was reported by the Beaver County Sheriff about 6 miles southwest of Milford. The tornado remained on the ground about 15 minutes before dissipating in the foothills northeast of Milford.

Lightning
According to the National Oceanic and Atmospheric Administration there have been a total of 53 reported deaths and 132 reported injuries from lightning in Utah between 1950 and 2002. See Table 12 below:

Table 12 Number of Lightening Caused Deaths

NUMBER OF LIGHTNING DEATHS IN UTAH 1950-2002 BY MONTH OF OCCURRENCE								
APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	TOTAL
3	4	6	14	16	6	2	2	53

NUMBER OF LIGHTNING INJURIES IN UTAH 1950-2002 BY MONTH OF OCCURRENCE								
APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	TOTAL
1	24	21	29	41	10	5	1	132

NUMBER OF LIGHTNING DEATHS IN UTAH 1950-2002 BY COUNTY			
Cache	2	Rich	1
Carbon	2	Salt Lake	7
Daggett	1	San Juan	6
Davis	1	Sanpete	3
Duchesne	4	Summit	3
Emery	1	Tooele	2
Garfield	**3**	Uintah	2
Grand	4	Utah	2
Iron	**1**	Wasatch	1
Juab	2	Wayne	1
Morgan	1	Weber	2
Piute	1	**STATE TOTAL**	**53**

Based upon this data, of the total number of lightning deaths in the State, 5.7% of the deaths occurred in Garfield County and 1.9% in Iron County. (See Table 1)

Table 13 Number of Lightening Caused Injuries

NUMBER OF LIGHTNING INJURIES IN UTAH 1950-2002 BY COUNTY			
Beaver	**2**	San Juan	3
Cache	7	Sanpete	1
Carbon	4	Sevier	1
Daggett	1	Summit	8
Davis	3	Tooele	10
Duchesne	7	Uintah	3
Emery	7	Utah	12
Garfield	**6**	Wasatch	3
Grand	3	**Washington**	**2**
Morgan	2	Wayne	1
Piute	1	Weber	4
Salt Lake	41	**STATE TOTAL**	**132**

Based upon this data, of the total number of lightning injuries in the State, 1.5% of the injuries occurred in Beaver County, 4.5% in Garfield County and 1.5% in Washington County.

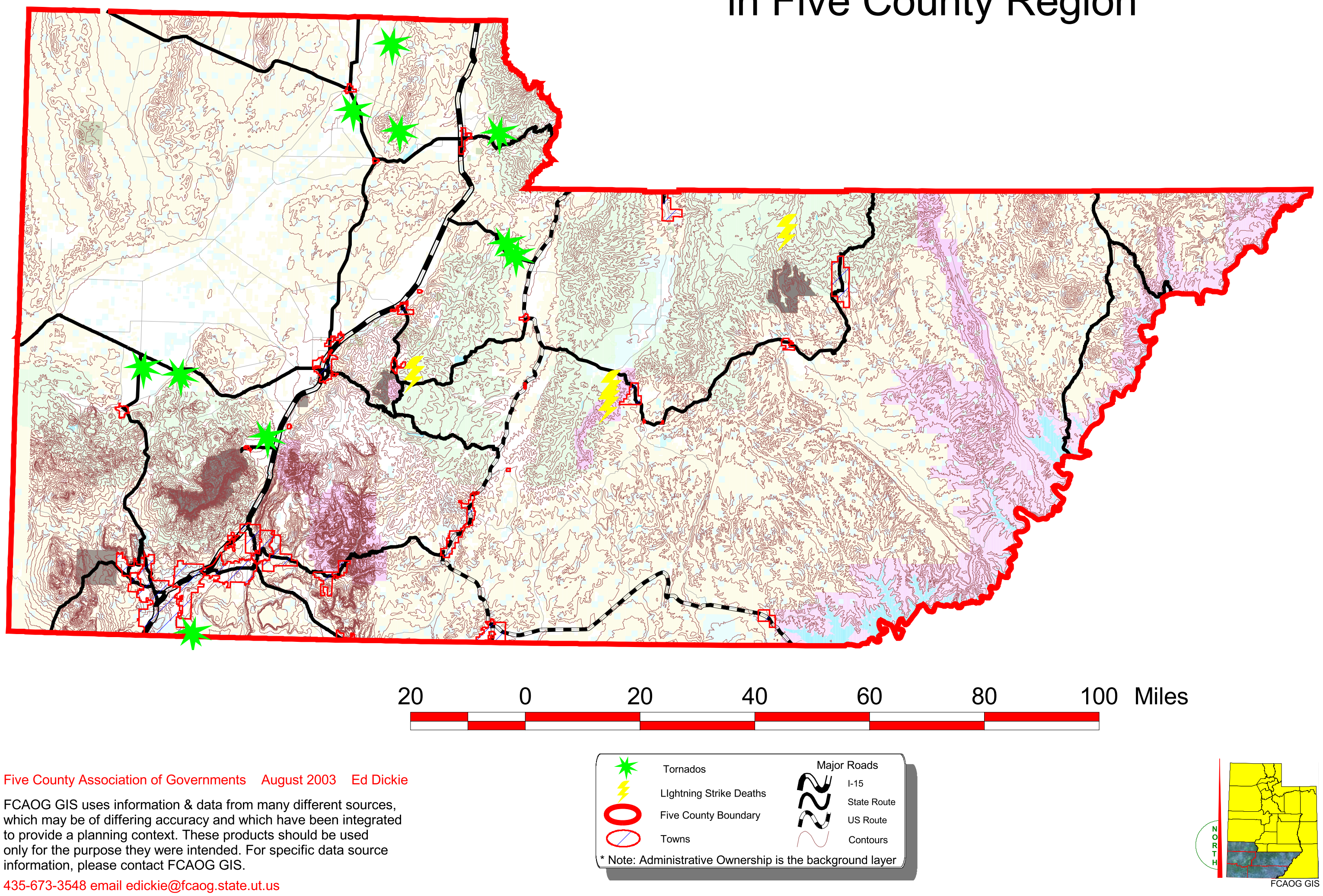
Cloudbursts

In the thirty year period between 1939 and1969, there were 836 cloudburst floods reported in Utah. Cloudburst floods which occurred in the five southwestern counties of Utah during the period 1939 through 1969 are detailed in Table 14.

Table 14 Number of Cloudburst Floods

County	Area	Number of Cloudburst Floods (1939-1969)	Percentage of Total Cloudburst Floods Occurring in State (1939-1969)
Beaver	Entire County	32	3.84%
	Unincorporated Portion of County	1	0.12%
	Beaver	6	0.72%
	Milford	9	1.05%
	Minersville	16	1.91%
Garfield	Entire County	42	5.04%
	Unincorporated Portion of County	8	0.96%
	Antimony	10	1.20%
	Cannonville	4	0.48%
	Escalante	5	0.60%
	Hatch	1	0.12%
	Henrieville	3	0.36%
	Panguitch	10	1.20%
	Tropic	1	0.12%
Iron	Entire County	39	4.68%
	Unincorporated Portion of County	2	0.24%
	Cedar City	25	3.00%
	Kanarraville	2	0.24%
	Paragonah	2	0.24%
	Parowan	8	0.96%
Kane	Entire County	28	3.36%
	Unincorporated Portion of County	3	0.36%
	Alton	3	0.36%
	Big Water (formerly Glen Canyon City)	2	0.24%
	Glendale	1	0.12%
	Kanab	14	1.68%
	Orderville (including Mount Carmel area)	5	0.60%
Washington	Entire County	35	4.20%
	Unincorporated Portion of County	9	1.08%
	Enterprise	1	0.12%
	Hurricane	2	0.24%
	Ivins	1	0.12%
	Leeds	1	0.12%
	Rockville	2	0.24%
	St. George	12	1.44%
	Santa Clara	3	0.36%
	Springdale	3	0.36%
	Washington	1	0.12%
Region	All Five Counties Combined	176	21.12%

Tornados' and Lightning Strike Deaths in Five County Region



Five County Association of Governments August 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Insect Infestation

FEMA Hazard Profile

Frequency: Low (usually in conjunction with drought whose pattern is cyclical)
Severity: Low to Moderate in most of the five counties of southwestern Utah. Severe in some portions of Beaver County, i.e. near Manderfield area north of Beaver City.
Duration: Several years or more. Usually same as normal 4 year cycle for drought

Mormon Cricket Infestation in Southwestern Utah

According to Mike Pace, Utah State University Extension Agent for Millard County, the Mormon cricket has reached legendary status in the State of Utah. This devastating insect plagued the early pioneers. Today, 150 years later, the Mormon cricket still economically devastates some parts of Utah.

Damage

The Mormon cricket is not a true cricket. The insect resembles more a lifestyle of a grasshopper. Mormon crickets are of economic importance in the fact that they destroy plants on rangeland, cropland, and vegetable gardens. Male and female Mormon crickets are large insects and can reach lengths of two and one-half inches during the adult stage. The female Mormon cricket is distinguished by the long ovipositor that also looks like a type of "stinger" located at the end of the abdomen. The male lacks this ovipositor. The Mormon cricket can be economically devastating. It has been calculated that a Mormon cricket at a density of one per square yard can consume 38 pounds of dry weight rangeland forage per acre. In Utah, the Mormon cricket destroys sagebrush, alfalfa, small grains, seeds, grasses, and vegetable crops.

Life Cycle and Characteristics

Mormon crickets hatch during the spring, and depending on elevation usually around the first few weeks of April. Young Mormon crickets are called nymphs. These nymphs develop during the spring months. They undergo seven stages of development called in-stars. It takes 60 to 90 days for the Mormon cricket to pass through these seven stages and obtain the adult stage. The female Mormon cricket lays its eggs during the summer months. The incubation of the eggs occurs during the fall and winter months. The eggs start hatching when soil temperatures reach 40 degrees Fahrenheit. The Mormon cricket cannot fly, but is still an extremely mobile insect. When the crickets are young, they do not migrate long distances. After about the fourth in-star and during the adult stage the Mormon crickets become ravenous and start banding together. Once the crickets have banded together, they begin migrating. During their migrations they destroy everything in their path. Mormon crickets are usually found migrating when skies are clear and temperatures are around 60 to 90 degrees Fahrenheit. In Utah, the crickets migrate under favorable conditions around 10:00 a.m. until about 2:00 p.m. Mormon crickets in the adult stage can cover a mile a day and up to 50 miles in a single season. During the night and during cold, wet weather, Mormon crickets clump together and can be seen clinging together on grasses and brush. They will also burrow underneath grass and brush to keep warm. The Mormon cricket is a hearty insect. They have been seen feeding when temperatures were less than 35 degrees Fahrenheit.

Control Methods
The most effective way to reduce Mormon cricket populations is to use carbaryl bait. The trade name is Sevin bait. This is usually oatmeal coated with the chemical insecticide carbaryl. The recommended application rate is 10 pounds to the acre. Using hand-held fertilizer spreaders can spread the bait or large machines that blow the poisoned grain a long distance. The idea is to apply a barrier of bait around or in front of a band of migrating crickets. Once the first wave consumes the bait they will die within a few minutes. The crickets coming from behind will eat the dead crickets causing a chain reaction of crickets being killed by the bait. Mormon crickets do not fly so they will almost always hit the barrier of poisoned bait. Many ranchers and farmers will apply the bait around the perimeter of their fields to reduce the number of crickets invading. Bait is also applied along roadsides to reduce the risk of car accidents from large numbers of crickets crossing highways. It is best to apply the bait when the crickets are still young or in the developing stages. Insecticide sprays such as Malathion could be effective against the Mormon cricket if they were sprayed during the nymphal stage. These insecticide sprays usually aren't recommended. Sevin bait is the preferred control method at this time in Utah.

Costs vary but usually average about $5 an acre for a minimum of 5,000 acres being sprayed. Some years there are government cost share programs to help spray large acres of rangeland. Usually, the land needs to border Federal or State lands to qualify for government aid. The insecticide most commonly used on rangelands is Malathion ULV applied at 8 oz. to the acre. It is important that spraying takes place early in the grasshopper’s life. The younger the grasshoppers are the better the kill rate. The best time to usually spray rangeland is the first three weeks in June. This is referred to as the "window of opportunity."

Cropland
The most profitable crops in Utah are alfalfa, corn, oats, wheat, rye, and barley. Grasshoppers concentrate in these croplands and destroy all vegetation present. This can be economically devastating for a farmer. Control on agricultural croplands is essential. As with rangelands you must determine whether there is an infestation of eight or more grasshoppers per square yard. If there is, then the two most effective control methods are ground spraying or aerial spraying. Ground spraying is usually more expensive per acre, but there is less chance of killing non target insects (bees). Aerial spraying is quick, usually less expensive, and has a high kill rate. The disadvantage is the potential damage to non-target insects. Usually, aerial spray applications are used when there are a higher number of acres to be sprayed. Malathion ULV and Dursban are two common insecticides used for grasshopper control on agricultural croplands. Justification for control depends on the crop, the crop's stage of growth, additional migration, and the type of damages being done to the crop. Grasshoppers hatch and migrate off bordering lands, and at times this is extremely frustrating to an agriculture grower trying to control grasshopper infestation. This is where the importance of communities pulling together to do a countywide spray program comes into play. The importance of government spraying of public lands bordering cropland cannot be stressed enough.

Lawns, Gardens, and Landscaping
Homes are being built on lands that have produced grasshopper populations for many years. This causes problems for the homeowner. Grasshoppers are hatching and laying eggs in the lawns and gardens. This makes it possible for the grasshoppers to hatch on the same lawn year after year. Grasshoppers are migrating out of vacant fields and low hills into the green, lawns and gardens. This results in thousands of dollars in damage to newly

planted landscapes. It is very important that communities work together in controlling grasshopper outbreaks. If one person is spraying, and neighbors are not, then the grasshoppers will just continue migrating from adjacent property. Vacant lots and fields need to be tilled in late fall to expose the eggs. Eggs are destroyed when they are exposed to the cold environment. Lawns need to be raked to also expose the eggs. Flower gardens usually have a population of eggs, so the soil should be turned over to expose the eggs. If there is an outbreak of grasshoppers on your landscape during the summer, start spraying early. Once you see that grasshoppers have invaded, even the little ones, start spraying with Dursban (chlorpyrifos) for use on turf and ornamentals, Malathion for use on turf, ornamentals and vegetables, or liquid Sevin (carbaryl) for use on turf, vegetables, and ornamentals.

Insecticide baits that use insecticide such as Sevin have not been an effective barrier against the grasshoppers in Utah. Grasshoppers fly and jump great distances and more than likely will miss the barrier of bait completely. This bait is very effective for the Mormon crickets.

Grasshopper Infestation
Grasshoppers are also a recognized problem for Utah. The extreme infestations do not occur every year, but there are grasshoppers to some extent each year. Extreme infestations seem to come in cycles of seven years and last approximately three years. Everyone needs to recognize there is a problem, and take the steps each year to combat the insects. Expose the eggs as often as possible, start spraying late spring and early summer to kill the immature grasshoppers, make your spraying programs a community effort, and keep informed on government spray programs for your area. If everyone does their part we can greatly reduce the grasshopper populations, and strive for a region free of these devastating insects.

State Response to Infestation
With the 2002 cricket and grasshopper fight not even over, the Utah Department of Agriculture and Food (UDAF) went before the Natural Resources, Agriculture and Environment Subcommittee seeking additional funds for 2003's fight. An estimated five million acres are expected to be infested during 2003, according to mid-Summer 2002 surveys by the UDAF and USDA. In 2002, more than 3.3 million acres were infested with Mormon crickets and grasshoppers in many of the state's 29 counties.

Governor Leavitt added insect infestation to a statewide disaster declaration dated April 24, 2003. 2002 was a disastrous year for Utah agriculture. Nearly every natural disaster thinkable has assaulted Utah farmers and ranchers. From drought, to insects, to frost, to high winds, virtually every grower has lost revenue because of the weather or other natural causes.

As of 2002, 3.5 million acres currently infested, centered in Beaver, Juab, Millard and Tooele counties. Five million acres are expected to be infested in 2003. The total UDAF expenses in 2002 for grasshopper/Mormon cricket survey and control were $241,000. The total state and private acres treated in 2002 was 26,000. The total acres treated were 98,500.

Drought conditions are causing crickets and grasshoppers to migrate to agricultural and populated areas. As a public safety measure in 2002 UDOT applied nearly 10,000 lbs. of bait along the sides of roadways. Funding for control in 2003 will require an estimated

$350,000 to control grasshoppers and crickets on State lands and fund cost share efforts on private lands.

USDA Designation of Utah Drought Disaster Area
In July 2003, U.S. Department of Agriculture Secretary Ann M. Veneman designated the entire state of Utah a primary natural disaster area due to drought, ***insect infestation*** and high winds. The designation came as Utah is suffering through its 5th year in a row of severe drought conditions. Water storage and stream flows in the state are approximately half of normal, and forecasted temperatures are expected to be above average with rainfall forecast to be less than normal. The federal declaration came several weeks following a formal request for assistance by Utah Governor Mike Leavitt on May 20, 2003.

Governor Mike Leavitt has stated that Utah farmers and ranchers desperately need this federal assistance. He asked Utah Commissioner of Agriculture, Cary Peterson, to help drought and insect-infested counties receive full benefit from this disaster declaration.

Utah has faced five years in a row of ever intensifying drought conditions, and is currently the driest state in the country, according to the USDA's Palmer drought index.

This designation makes farm operators in all 29 Utah counties eligible to be considered for low-interest emergency loans from the Farm Service Agency (FSA), provided eligibility requirements are met.

Insect Infestation

Vulnerability Assessment

Overall Summary of Impacts
Insect infestation in Southwestern Utah is varied in location, species of insects and severity of infestation. The Mormon cricket, so called because of the heartache it once brought early Utah settlers, is devouring acres of wheat, barley, and oats in the state. In 2003's infestation, which also affects Idaho and Nevada, might be the worst in recent history. Forests of southwestern Utah are also infested with several species of beetles and other damaging insects.

Grasshopper and Mormon cricket Infestations
The State of Utah Department of Agriculture and Food has said that no one who works for their department has seen it this bad. For the sixth year in a row an estimated 5 million to 6 million acres of farm and ranchland in Utah are infested with crickets and grasshoppers.

A statewide agricultural disaster based on the continued drought, insect infestation, and high winds was recently declared by FEMA providing help from the federal government such as low-interest loans for farmers and ranchers. According to Utah state officials crickets and grasshoppers have caused $25 million in damages from lost crops. According to the Utah Department of Agriculture, wheat, barley, oats, and alfalfa are the main crops affected by the insect infestation, with most of the damage occurring in rural and central Utah. State officials say one cricket can consume 38 pounds of forage during its lifetime.

Utah has a long and colorful history of problems with the insect dating back to the early days. When Mormon settlers attempted to harvest crops in 1848 hordes of crickets swarmed the area destroying the crops. According to state history, failed attempts to fight the crickets sent the Mormon pioneers to their knees in prayer. Thousands of sea gulls appeared and devoured the crickets and saved the crops. On historic Temple Square in Salt Lake City visitors can see a monument to the sea gull that reads: "In grateful remembrance of the mercy of God to the Mormon Pioneers."

The largest infestation of grasshoppers in Utah in 2002 was in Millard County which neighbors Beaver County at the north of this region. 23,024 acres of BLM land in that county were infested with Grasshoppers with 11,512 acres being treated with an insecticide. Mormon cricket populations in 2003 are perhaps the largest in Utah's recorded history. Mormon crickets infestation has now extended into Beaver County reaching to near the northern city limits of Beaver City. Statewide, the acres affected by infestation of grasshoppers and Mormon crickets is shown in Table 15 below:

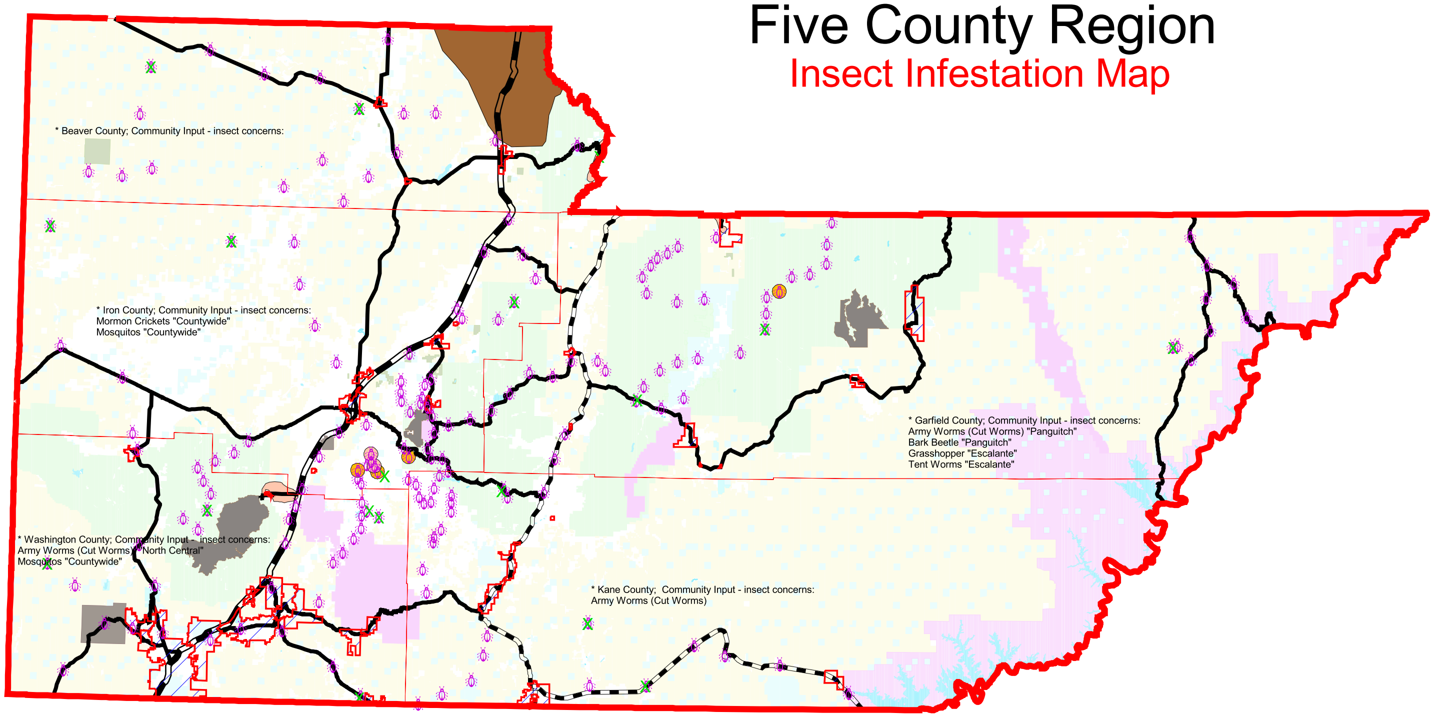
Table 15 Acres Infested by Grasshoppers and Mormon Crickets by Ownership

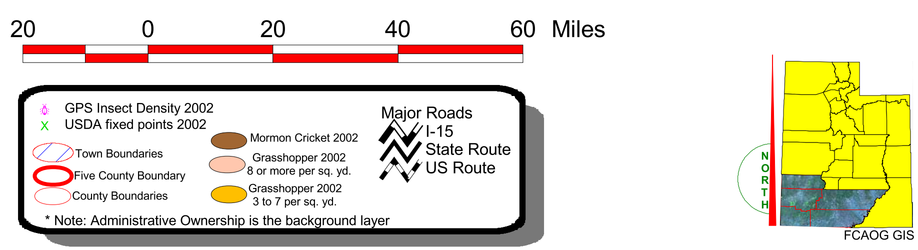
Adult Insects Surveyed		
Land Ownership	Acres with grasshoppers >8 per square yard	Acres with Mormon crickets
Private	524,600	478,600
State	47,300	209,550
U.S. Forest Service	50,000	100,000
U.S. BLM	242,000	1,662,550
TOTAL	863,900	2,450,650

Grasshopper Infestation in Southwestern Utah Counties		
County	Area within county infested	Total Acres Infested (2002)
Beaver County	near the Piute County line	4,043
Garfield County	within and to the southeast of Antimony Town	4,313
Iron County	East of Kanarraville	8,967
Kane	None	0
Washington	Near New Harmony	7,957
	TOTALS	25,280

Five County Region

Insect Infestation Map





Five County Association of Governments July 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Radon Gas

Radon Hazard in Southwestern Utah

FEMA Hazard Profile
Frequency: Likely
Severity: Low to Moderate in the five southwestern Utah counties. Locally higher in Beaver County.
Duration: Ongoing risk

Average Level of Radon
Based on a national residential radon survey completed in 1991, the average indoor radon level is 1.3 picoCuries per liter (pCi/L) in the United States. The average outdoor level is about 0.4 pCi/L.

Average Level of Radon Found in Southwestern Utah
The U.S. EPA and the U.S. Geological Survey have evaluated the radon potential in each state and developed radon zone mapping to assist state and local organizations to target their resources and to assist building code officials in deciding whether radon-resistant features are applicable in new construction. A radon zone map is not intended to be used to determine if a home in a given zone should be tested for radon. Homes with elevated levels of radon have been found in all three zones. All homes should be tested regardless of geographic location. The map below assigns each of the 29 counties in Utah to one of three zones based on radon potential. Each zone designation reflects the average short-term radon measurement that can be expected to be measured in a building without the implementation of radon control methods. The radon zone designation of the highest priority is Zone 1. All five of the counties in the southwestern region are located in Zone2 with a moderate potential for radon exposure

What's the Debate on Radon?
There is no debate about radon being a lung carcinogen in humans. All major national and international organizations that have examined the health risks of radon agree that it is a lung carcinogen. The scientific community continues to conduct research to refine our understanding of the precise number of deaths attributable to radon. EPA and the National Cancer Institute (NCI) have independently placed that number at about 15,000 lung cancer deaths each year in the United States.

A few scientists have questioned whether low radon levels, such as those found in residences, increase the risk of lung cancer because some small studies of radon and lung cancer in residences have produced varied results. Some have shown a relationship between radon and lung cancer, some have not. However, the national and international scientific communities are in agreement that all of these residential studies have been too small to provide conclusive information about radon health risks. All major scientific organizations continue to believe that approximately 10% of lung cancers in the United States -- or about 15,000 lung cancer deaths annually -- are attributable to radon.

How Do We Know Radon is a Carcinogen?
The World Health Organization (WHO) and the US Department of Health and Human Services, as well as the U.S. Environmental Protection Agency, have classified radon as a

"Class A" known human carcinogen, because of the wealth of biological and epidemiological evidence and data showing the connection between exposure to radon and lung cancer in humans.

The World Health Organization, the National Academy of Sciences and other scientific organizations agree that studies of the miners are the best scientific information for estimating radon health risks in homes. The Lubin/Boice meta-analysis paper also concludes that the miners studies are the best data source for analyzing residential radon risk. Based on the miner data, NCI has previously estimated that 15,000 people die of lung cancer from residential radon each year in the U.S.

There have been many studies conducted by many different organizations in many nations around the world to examine the relationship of radon exposure and human lung cancer. The largest and most recent of these was an international study, led by the National Cancer Institute (NCI), which examined the data on 68,000 underground miners who were exposed to a wide range of radon levels. The studies of miners are very useful because the subjects are humans, not rats, as in many cancer research studies. These miners are dying of lung cancer at 5 times the rate expected for the general population. Over many years scientists around the world have conducted exhaustive research to verify the cause-effect relationship between radon exposure and the observed increased lung cancer deaths in these miners and to eliminate other possible causes.

In addition, there is an overlap between radon exposures received by miners who got lung cancer and the exposures people would receive over their lifetime in a home at EPA's action level of 4 pCi/L, i.e., there are no large extrapolations involved in estimating radon risks in homes.

Is Radon Really a Problem?
Nearly one in fifteen homes in the U.S. is estimated to have elevated radon levels. Elevated levels have been found in every state. While radon problems may be more common in some areas, any home may have a problem. In addition, the level of radon in a nearby home or building cannot be used to predict the level of radon in your home or building. Two adjacent houses may have very different radon levels. EPA recommends that all homes below the third floor be tested for radon and that all schools are tested.

Radon Problem in Beaver County
The radon-gas hazard potential in the Beaver Basin area is one of the highest in the state according to an August 1998 news release by the Utah Geological Survey. The Basin was identified by the Utah Department of Environmental Quality as an area of concern after tests showed indoor radon levels were the highest recorded in the state. The UGS began identifying and studying areas of Utah with a high potential for radon as part of the Toxic Substances Control Act and the Indoor Radon Abatement Act of 1988. The IRAA authorized the State Indoor Radon Grant program, providing funding so states could develop and continue radon assessment and mitigation programs. Since then, the UGS has studied nine areas of the state that the DEQ identified as problematic. Those reports, including the Beaver Basin one, are available in the Department of Natural Resources Map and Bookstore, 1594 West North Temple, Salt Lake City, Utah. The publications also contain information on how to prevent radon gas from infiltrating into structures, as well as how to reduce radon levels that are already present.

According to the author of the latest report, geologist Charles E. Bishop, the radon levels in the Beaver Basin area "are well above those considered a health risk by the U.S. Environmental Protection Agency." The basin encompasses about 160 square miles in eastern Beaver County in southwestern Utah. A natural depression, the basin floor, or "fill," is comprised of sediments derived from volcanic and other rocks that have a high content of uranium. This basin-fill deposit is characterized by moderate to high permeability. Ground water depth is greater than 10 feet in most of the region, and the area is bounded by mountains that also have high uranium levels. These factors account for the elevated radon-hazard potential.

According to Mr. Bishop, radon-hazard studies are necessary "to organize and prioritize testing in existing buildings and to indicate where radon-resistant construction should be considered in new buildings. Indoor-radon levels are easily and inexpensively measured, and various methods to reduce the levels are available."

Testing for Radon
The only sure way to determine if a home has a problem with radon is to test. It is important to use an Environmental Protection Agency approved test kit.

There are two general ways to test for radon. Short-term testing uses a kit that remains in a home from two days to 90 days depending on the device. Such devices are available at a discount price from the Utah Safety Council. Long-term testing uses a kit that requires a minimum testing period of 90 days and maximum of one year. Long-term radon test kits are available through the National Radon Hotline at (800) SOS-RADON.

Renovating Existing Construction
Radon problems determined through testing in existing homes are fixable. Radon reduction measures can vary with radon levels, but most often the measures may cost no more than having a new hot water heater installed or having the house painted. The cost of a contractor fixing a home generally ranges from $500 to $2500, depending on the characteristics of the house and choice of radon reduction methods. For a list of EPA approved contractors in Utah, contact the Utah Safety Council; 5263 South 300 West, Suite 201; Salt Lake City, Utah 84107.

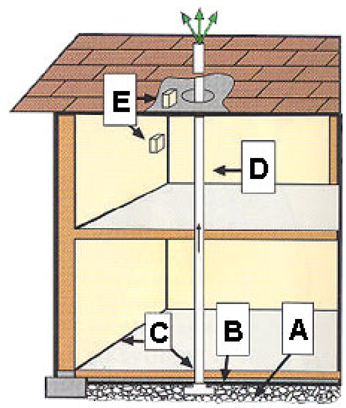
Radon-Resistant New Construction
Specific construction techniques can help block radon from entering the home. The occupants will benefit from lower radon levels in their new home. Homes constructed with radon resistance techniques are easier to upgrade if there is a need to Increase the radon reduction. If high radon levels are found, new techniques allow for easy and inexpensive installation of a fan for increased radon reduction in the home. While every new home should be tested for radon by the homeowner after occupancy, it is more cost-effective to include radon-resistant techniques while building a home, rather than installing a radon reduction system in an existing home. For Example,
materials and labor costs for radon-resistant techniques vs. retrofitting an existing home is $350 to $500 vs. $800 to $2,500, a 128% to 400% savings. Some construction companies successfully use this as a marketing advantage.

Radon-resistant Construction May Improve a Home's Energy-Efficiency
Radon-resistant construction techniques are consistent with state-of-the-art energy-efficient construction. When using these techniques, follow the Model Energy Code (or other

applicable energy codes) for weatherization, which will result in energy savings and lower utility bills.

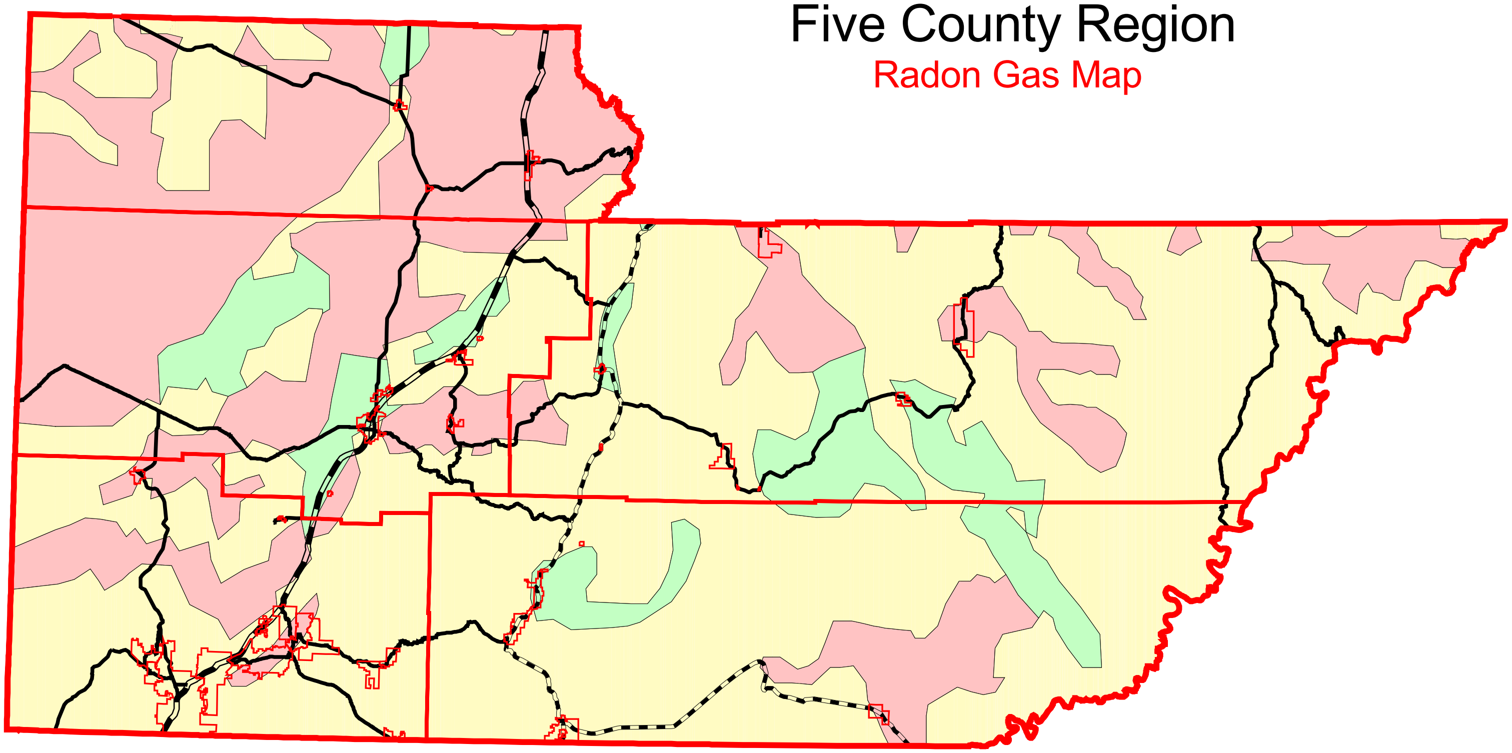
What are Radon-resistant Construction Techniques?

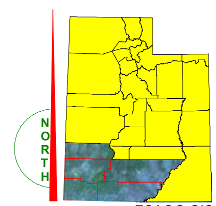
Techniques may vary for different foundations and site requirements, but the basic elements are:

<table>
<tr><td>A. Gas Permeable Layer This layer is placed beneath the slab or flooring system to allow the soil gas to move freely underneath the house. In many cases, the material used is a 4-inch layer of clean gravel.</td><td rowspan="5">
</td></tr>
<tr><td>B. Plastic Sheeting Plastic sheeting is placed on top of the gas permeable layer and under the slab to help prevent the soil gas from entering the home. In crawlspaces, the sheeting is placed over the crawlspace floor.</td></tr>
<tr><td>C. Sealing and Caulking All openings in the concrete foundation floor are sealed to reduce soil gas entry into the home.</td></tr>
<tr><td>D. Vent Pipe A 3- or 4-inch gas-tight or PVC pipe (commonly used for plumbing) runs from the gas permeable layer through the house to the roof to safely vent radon and other soil gases above the house.</td></tr>
<tr><td>E. Junction Box An electrical junction box is installed in case an electric venting fan is needed later.</td></tr>
</table>

Five County Region

Radon Gas Map



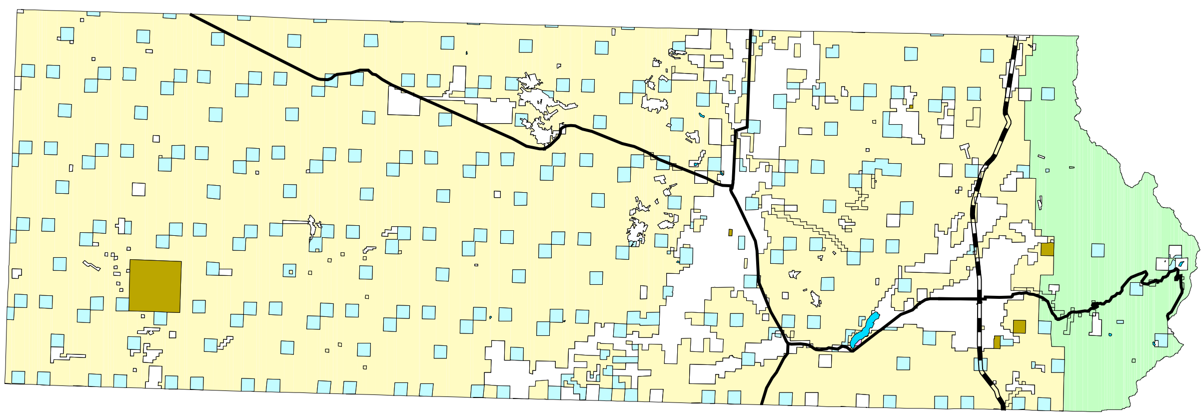


Five County Association of Governments July 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Beaver County



History

Beaver County history dates back to 1776 when Franciscan priests searched for a shorter route between missions and happened to pass through the richly abundant area now enjoyed by thousands of similar travelers each year. Father Escalante and Father Dominguez recorded in their dairy, "We found everything convenient, it being necessary to go to the arroyo for water or to its meadow for pasture." The convenience found by those priests more that 200 years ago is still here today.

Many historical sites have been preserved and maintained. The Horn Silver Mine at Old Frisco - west of Milford in the San Francisco Range - was opened in 1800 or so, and proved to be one of the richest mines in history. The ghost town of today offers an excellent day of exploration, adventure, and a reminder of the boom past.

The old Beaver County Courthouse in Beaver City, with its classical architecture has been restored and now offers tours. Beaver Historical Park, adjacent to the courthouse features a stature of Philo T. Farnsworth, the father of television.

The county has many other historical sites marked along its highways and byways, in addition to more than 100 homes listed on the national historical register. It's also the birthplace of the infamous Butch Cassidy.

Beaver City, the Beaver County seat, is located just south of the I-15 and I-70 Interchange. Beaver City proximity to some Utah cities is shown below.

Salt Lake City - 200 miles
Moab - 235 miles
Green River - 184 miles
St. George - 105 miles

The average temperature in January is 41º F, and the average July temperature is 88º F. Annual Average Precipitation is 11.7"

Development Trends

Population

Beaver County suffered from three decades of out-migration before it started growing again in the 1980s. During the1990s population growth incremented upward. From 1990 to 2000, Beaver County ‘s population grew by 29 percent. This placed Beaver County almost exactly in the middle of the rankings of Utah’s counties. This was also the largest 10 year increase, percentage-wise, since 1910. The 29 percent increase was over double the national average of 13 percent.

In the 1990s, Minersville was the fastest growing community in Beaver County, increasing by one-third (34 percent) between 1990 and 2000. Milford City’s population grew by 31 percent and Beaver City’s population grew by 23 percent. The population of the balance of the county grew by 22%. In hard numbers, Beaver City grew by 456 persons, Milford by 344, Minersville by 209 and the balance of Beaver County by 231 persons.

Labor Market Indicators

Beaver County's *non-farm* jobs dropped by 1.4 percent in 2001. "*Covered agricultural*" jobs make up a large share of Beaver County's employment base. While not usually counted because they represent only a limited share of agricultural employment in some counties, these figures provided added insight into Beaver County's economy. In the case of Beaver County, expansion in covered agricultural jobs was enough to move Beaver County's employment expansion figures up to 0.3 percent.

Most of Beaver County's major industries lost employment during 2001. Only construction, mining, trade and covered agriculture added new jobs. Only covered agriculture showed a year-over increase of more than ten jobs.

The services and transportation/communication/utilities industry job losses put the largest drag downward on the Beaver County economy. Those losses were enough to bring the unemployment rate up to 4,2 percent in 2001. That amount is still a relatively low jobless rate for a non-urban county and is below state and national averages.

Data from the 2000 U.S. Census show that Beaver County's labor force participation increased during the 1990s. A younger working age population contributed to that change, as did a rise in the number of women working outside the home. Approximately 60 percent of the children under 6 in Beaver County have both parents in the Beaver County labor force.

Construction Permits

The value of total construction permits issued in Beaver County during 2001 dropped by 35 percent. Declines in new residential building and non-residential additions/alterations/repairs produced this annual decline. New, non-residential construction actually had a slight increase during 2001.

Taxable Sales

The gross taxable sales figures reflected another economic downturn in 2001. Sales dropped by 4 percent and was the first such drop in almost ten years. Sales in the retail sector actually increased in 2001. Sales in the wholesale trade and services sector, however, declined coupled with declining capital expenditures led to this decrease in sales activity.

Wages and Income

Wages in Beaver County are relatively low, with an average monthly wage of $1,742. Beaver County ranks in the bottom third of Utah's counties. The county's average wage measured only 70 percent of the state average. This was a significant decrease from 1989 when wages were 82 percent of the state average. On a positive note, in 2001 average wages increased by more than 3 percent, just slightly ahead of inflation.

Transportation/communications/utilities are the highest-paying industry in Beaver County. Trade showed the lowest average wage because many trade jobs are part-time and low-paying.

Median family income figures in Beaver County rank well below state and national averages. In terms of per capita personal income, Beaver County ranks in the lower half of counties in the state. On a positive note, however, only 8 percent of the county population is counted among those in poverty. This is lower than both state and national averages.

Land Use

A variety of land uses are represented in Beaver County. The major land uses in Beaver County are indicative of the ownership by federal and state governments. The Bureau of Land Management (BLM) areas are used primarily for grazing, mining, recreation, and open space. Most of the forested areas in the county are contained in National Forest boundaries. The National Forest lands have multiple uses which include recreation, timber cultivation and harvest, grazing, wildlife habitat, and watersheds. Privately owned lands, which account for the smallest percentage of the total land are in Beaver County, are given to the most diverse uses.

The majority of urban land uses, including residential, commercial, industrial and public uses are located in or near the three incorporated municipalities in Beaver County: Beaver City, Milford City and the town of Minersville. Beaver City and Milford City are the County's primary centers for commerce and social activity. Beaver City is the County seat and derives a considerable portion of its income from the tourism market. Milford is a railroad and agricultural center. Minersville, and the unincorporated communities in Beaver County are primarily agricultural in character.

The Beaver County General Plan, as amended, has set goals and policies with regards to development in the County. The Land Use Element supports infill development to maintain the viability of existing developed areas. Development is encouraged to occur within tiered growth boundaries. Beaver County's policy is to encourage development close where public facilities and services are available. The General Plan also designates areas as future developing areas and those which will be provided for rural/agricultural development with appropriate land uses, at appropriate densities, and with appropriate services. The General Plan also states that the County, along with the cities and towns shall create an interlocal agreement to establish the process a process in which the County will designate areas near towns and cities as Joint Planning/Expansion Areas. The purpose of this policy is to develop plans which are consistent with those of the local entities. Beaver City, Milford City and the town of Minersville have all incorporated tier systems in their general plans in an effort to coordinate the planning efforts around their jurisdictions.

Development Activities

The following activities have occurred in beaver County during the past year. While this is not an all-inclusive listing, is indicative of the development trends occurring in Beaver County.

Schmitt Industries, whose president owns Elk Meadows Resort above Beaver, reported a net loss of $1.7 million, or 69 cents per share, for the quarter ending Feb. 28. Oregon based Schmitt makes sensitive measuring devices. Elk Meadow was unable to open this year as company President Wayne Case struggled to secure financing for the planned construction of a base village for the resort. Salt Lake Tribune, 04/15/03

Circle Four Farms announced plans to build a $20 million "waste to energy" facility that will convert swine manure into cleaner burning biodiesel fuel. If successful, Circle Four will solve about half its waste disposal problems, create more jobs in rural Utah, make more money, help clean the air and reduce the nation's dependence on foreign oil. Salt Lake Tribune, 02/23/03

The Milford Valley Memorial Hospital board decided to close the facility on February 28 after determining the debt by then would be too steep. However, the county and the special service district, which collects tax money for the hospital, plan to keep the 34bed facility open. Whatever happens, Nephi based Rural Health Management Corp. will soon cease to operate the hospital. Salt Lake Tribune 1/10/03

The decision has been made to not open Elk Meadows Resort for downhill skiing for the 2002-03 season. The lifts, grooming, half pipe and ski patrol will not be provided. The resort had to layoff most of Elk Meadows limited staff in late October citing a lack of financing to support winter operations. Salt Lake Tribune, 12/20/02

Circle Four Farms plans to build a massive new state-of-the-art waste treatment plant. The plant would process tens of millions of gallons of feces and urine excreted in the annual production of 1 million farms in Beaver and Iron counties. The "digester" would convert much of the waste into methane gas and methanol providing an additional source of income. The new process could reduce the risk of pollution and improve the air for residents living downwind from the hog farms. Salt Lake Tribune, 12/02/02

A Comfort Inn hotel recently opened in Beaver. The hotel feature 46 rooms, as well as a meeting room that can accommodate up 40 people, heated indoor pool and hot tub, exercise facility and breakfast area. Deseret News, 11/05/02

Beaver County has given conceptual approval to an additional 3,245 units at Elk Meadows Ski Resort. The resort is trying to secure funding for the linchpin of that proposed development of a 126 room, condo-style hotel known as The Inn at Mt. Holly. Salt Lake Tribune, 11/03/02

The construction crews building part of "Spread 5," Kearn River's 1.2 billion pipeline, 15 miles west of Beaver City have brought a boom of economic activity to Beaver County's businesses, especially restaurants and motels. About 420 workers, plus 40 inspectors are involved this "spread." Salt Lake Tribune, 11/2/02

Rural Utah counties preparing budgets for next year may face cutbacks in federal PILT funds. Since 1977, the federal government has provided "payment in lieu of taxes" funds to counties with large tracts of nontaxable federal land. The federal budget for 2003 has yet to be approved, and President Bush wants to cut PILT money by 23.5 percent. Utah is fifth in the nation in PILT funding, behind California. In 2002, Utah received more than $16 million. Deseret News, 10/15/02

Utah ranchers, hit hard by drought, will soon receive millions of dollars in immediate federal aid. The U.S. Department of Agriculture announced it would release $752 million in cash to relieve drought-stricken livestock in 37 states. Utah is one of seven states that has declared a statewide drought disaster, and therefore, will qualify for a large share of the money. Salt Lake Tribune, 09/20/02

Beaver County officially took control of the former Minersville Reservoir State Park as a result of the Legislature's effort to save $500,000 by shedding several smaller parks from the state's parks and recreation system. Salt Lake Tribune, 07/2/02

Critical Facilities of Beaver County

A listing of the Critical Facilities of Beaver County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 16 below:

Table 16 Critical Facilities of Beaver County

Name or Description of Asset **Beaver City**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Beaver City Hospital	Beaver City	X	X		X		n/a	$8,000,000	
Beaver City Downtown Fire Station	Beaver City	X					n/a	$ 250,000	
Beaver SSD Fire Station	FCAOG CED Div.	X					7,200	$300,000	
North Creek Water Tank	Beaver City	X					n/a	$250,000	
Golf Course Water Tank	Beaver City	X					n/a	$250,000	
Bakers Canyon Water Tank	Beaver City	X					n/a	$150,000	
Jackson County Water Tank	Beaver City	X					n/a	$150,000	
Beaver Sewer Lagoons	Beaver City	X			X		n/a	$3,000,000	
Upper Canyon Hydroelectric Plant	Beaver City	X					n/a	$2,000,000	
Middle Canyon Hydroelectric Plant	Beaver City	X					n/a	$1,000,000	
Golf Course Hydroelectric Plant	Beaver City	X					n/a	$1,000,000	
Beaver Municipal Airport Facilities (Not Including runways)	Beaver City	X		X	X		n/a	$ unknown	

Name or Description of Asset **Milford City**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Consideration**	**Historic/Other Consideration**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Milford Valley Memorial Hospital	Special Service District	X					n/a	$unknown	
Milford City Fire Station	Milford City	X					2,700	$179,300	
City Hall/Incl. Sheriff's Office	Milford City	X					14,671	$1,066,860	
Water Tank	Milford City	X					1.9MG	$719,670	
Milford Airport Facilities (Not including runways)	Milford City			X			4,323	$195,550	
Milford Sewer Lagoons (Equipment Only)	Milford City	X					N/A	$35,000	
Milford High School	Beaver County School District	X					7,2187	$8,600,000	

Name or Description of Asset **Minersville Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Consideration**	**Historic/Other Consideration**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Minersville Town Office		X						$	
Minersville Water Tank		X						$	
Minersville Senior Citizens Center	FCAOG CED Division	X					2,200 sq. ft.	$150,000	
Minersville Medical Clinic	Special Service District	X						$	
Minersville Fire Station	FCAOG Consolidated Plan	X					900 sq. ft.	$94,500	
Water Tank		X						$	
Water Tank		X						$	
Sewer Lagoons		X						$	
Minersville K-8 School		X	X				42,000 sq. ft.	$	

Analysis of the Infrastructure of Beaver County

A listing of the Infrastructure of Beaver County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 17 below:

Table 17 Critical Infrastructure of Beaver County

Name of Town **BEAVER**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Hazard Costs in Millions**
# of Dams (High Hazard)	5	0	5	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	54	14	40	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	155.96	2.61	150.46	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	62.76	0	62.76	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	148.27	2.51	145.76	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	48.46	0	48.46	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	.01	.01	0											
Land Slides (sq miles)	49.53	0	49.53											
Problem Soils (sq miles)	88.53	0	88.53											
Volcanic Flows (sq miles)	37.04	0	37.04											
Wildfires (sq miles)	1104.8	0	1104.01											

Name of Town **MILFORD**	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	5	0	5	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	54	0	40	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	155.96	1.97	150.46	0	0	0	0	0	0	0	0	.03	0	0
Railways (miles)	62.76	0	62.76	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	148.27	0	145.76	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	48.46	0	48.46	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	.01	0	0											
Land Slides (sq miles)	49.53	0	49.53											
Problem Soils (sq miles)	88.53	0	88.53											
Volcanic Flows (sq miles)	37.04	0	37.04											
Wildfires (sq miles)	1104.8	.79	1104.01											

Name of Town **MINERSVILLE**	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	5	0	5	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	54	0	40	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	155.96	.92	150.46	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	62.76	0	62.76	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	148.27	0	145.76	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	48.46	0	48.46	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	.01	0	0											
Land Slides (sq miles)	49.53	0	49.53											
Problem Soils (sq miles)	88.53	0	88.53											
Volcanic Flows (sq miles)	37.04	00	37.04											
Wildfires (sq miles)	1104.8	.01	1104.01											

Unincorporated Areas of County	County Total	Towns Total	Unincorporated	FloodZone Unincorporated	Flood Zone Costs in Millions $	LandSlide Unincorporated	Land Slide Costs in Millions $	ProblemSoil Unincorporated	Problem Soil Costs in Millions $	VolcanicFlow Unincorporated	Volcanic Flow Costs in Millions $	Wildfire Unincorporated	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	5	0	5	0	0	1	0	0	0	0	0	6	0	0
# of Highway Bridges	54	0	40	0	0	3	15	0	0	0	0	12	0	15
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	155.96	.92	150.46	0	0	6.03	24	1.40	6	1.08	4	60	0	34
Railways (miles)	62.76	0	62.76	0	0	0	0	0	0	0	0	4.36	0	0
Utility Lines (miles)	148.27	0	145.76	0	0	8.98	.45	0	0	5.96	.23	85.8	4.29	4.97
Other Utility Lines (miles)	48.46	0	48.46	0	0	.36	.018	0	0	0	0	.73	.365	.545
HAZARDS														
Flood Zones (sq miles)	.01	0	0											
Land Slides (sq miles)	49.53	0	49.53											
Problem Soils (sq miles)	88.53	0	88.53											
Volcanic Flows (sq miles)	37.04	00	37.04											
Wildfires (sq miles)	1104.8	0	1104.01											

Wildfire

FEMA Hazard Profile

Frequency: Likely (drought patterns are cyclical)
Severity: Negligible to structures in incorporated communities and Moderate to High to structures in unincorporated Beaver County.
Duration: Containment time varies for each fire.

Assessing Vulnerability: Identifying Assets and Estimating Losses

Overall Summary of Impacts

Wildfires occur every year in the United States. Factors that influence the potential for wildfires include: type, amounts and conditions of fuel supply (vegetation); temperatures; wind conditions; precipitation patterns; humidity levels; topography and the levels of human activity on the land. Fires in areas of heavy vegetation, if not quickly detected and suppressed can quickly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property.

Most rural wildfires result from thunderstorm activity. In addition, other wildfires are started by acts of human carelessness during activities such as controlled burns of forest areas; burning of ditch banks and fields by landowners; recreational activity such as camping, hunting, and other off-road vehicle travel; and use of both legal and illegal fireworks.

The Five County Association of Governments GIS, utilizing available data, has identified residential and commercial structures at moderate or high risk from wildfire. See Table 18 below for an analysis of wildfire risk in Beaver County.

In unincorporated Beaver County there are 81 residential structures at moderate risk from wildfire. Based upon figures provided by the Beaver County Assessors Office, the market value of those structures is estimated to be $5,414,283. There are approximately 30 residential structures at high risk from wildfire. Based upon figures provided by the Beaver County Assessors Office, the market value of those structures is estimated to be $2,004,390. There are 2 commercial structures in unincorporated Beaver County in a moderate risk area with an estimated market value of $790,645.

Based upon the average household size of 2.93 persons, in unincorporated Beaver County, from the 2000 U.S. Census, there are approximately 325 persons at risk from wildfire. This is 25.33% of the 1,283 population of unincorporated Beaver County.

In Milford City there is one residential structure at moderate risk from wildfire. Based upon figures provided by the Beaver County Assessors Office, the market value of that structure is estimated to be $49,979. There are approximately 5 residential structures in Milford City at high risk from wildfire. Based upon figures provided by the Beaver County Assessors Office, the market value of those structures is estimated to be $197,605. Based upon the average household size of 2.95 persons, in Milford City, from the 2000 U.S. Census, there are approximately 15 persons at risk from wildfire. This is 1.03% of the 1,451 population of Milford City.

Number of People and Buildings/Structures Impacted by Wildfire

Table 18 Analysis of Wildfire Risk in Beaver County

Beaver City - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	902	0	0%	$62,438,492	$0	0%	2,454	0	0%
Commercial	131	0	0%	$19,143,467	$0	0%	N/A	N/A	N/A
Total	1033	0	0%	$ 81,581,959	$0	0%	2,454	0	0%

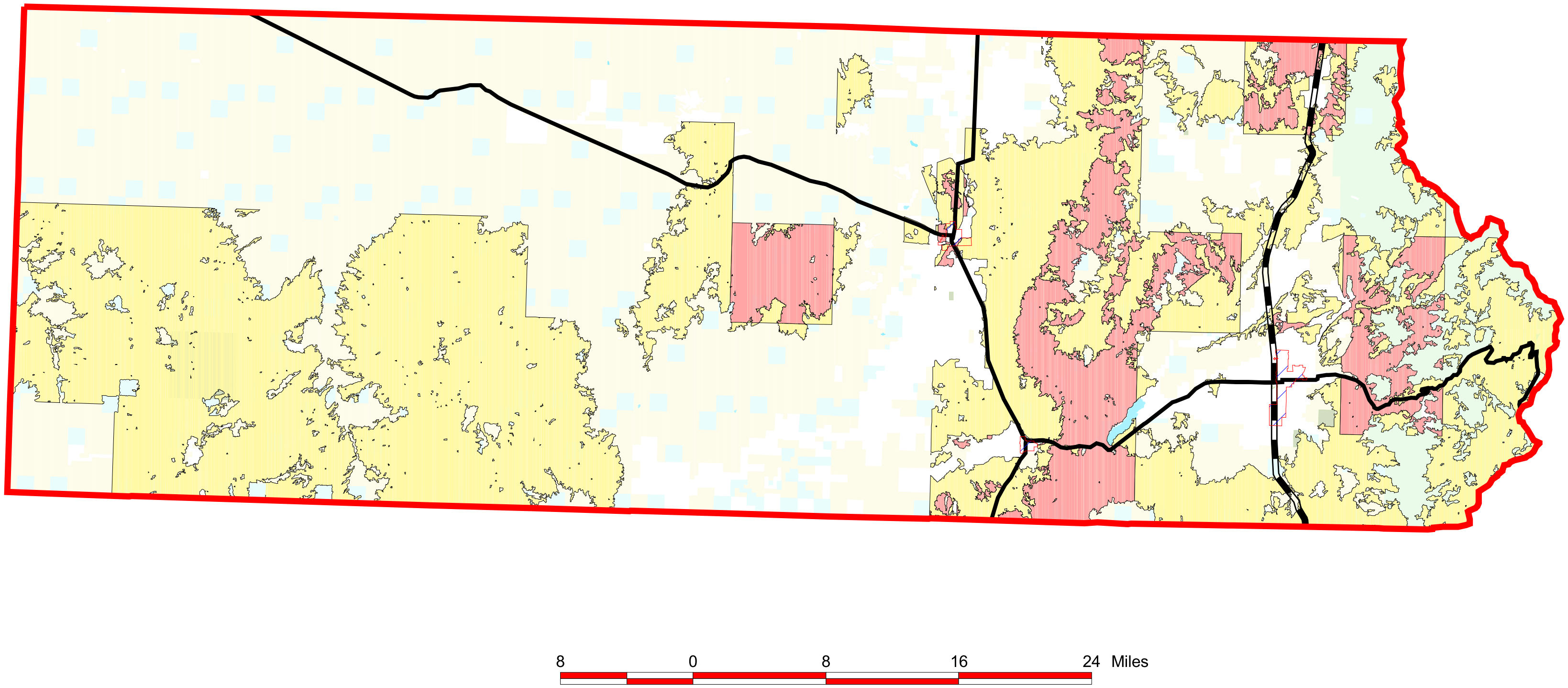
Milford City – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	527	5	0.94%	$26,339,047	$247,584	0.94%	1,451	15	1.03%
Commercial	51	0	0%	$13,161,122	$0	0%	N/A	N/A	N/A
Total	578	5	0.86%	$39,500,169	$247,584	0.62%	1,451	15	1.03%

Minersville Town - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	269	0	0%	$16,661,010	$0	0%	817	0	0%
Commercial	12	0	0%	$824,648	$0	0%	N/A	N/A	N/A
Total	281	0	0%	$17,485,658	$0	0%	817	0	0%

Unincorporated Beaver County areas - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	764	111	14.52%	$51,068,106	$7,415,088	14.52%	1,283	325	25.33%
Commercial	20	2	10.00%	$2,343,392	$790,645	33.73%	N/A	N/A	N/A
Total	784	113	14.41%	$72,097,792	$8,205,733	11.38%	1,283	325	25.33%

Beaver County

Wildfire Map

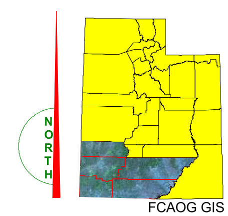


Fire Danger Categories W/ sq. miles

	sq. miles
Extreme	.02
High	203.64
Moderate	901.14

County Boundary
Town Boundary
Major Roads
I-15
State Route

* Note: Administrative Ownership is the background layer



Five County Association of Governments July 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Landslide

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe
Duration: range from very short duration slope failures to long-term ground movement. Duration varies by location.

Assessing Vulnerability: Identifying Assets and Estimating Losses

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available data, has identified and mapped residential and commercial structures at potential risk from landslide. See Table 19 below for an analysis of landslide risk in Beaver County.

In unincorporated Beaver County there are approximately 12 residential structures in the Elk Meadows 12 residential structures in the Elk Meadows area at potential risk from landslide. Based upon figures provided by the Beaver County Assessors Office, the market value of those structures is estimated to be $1,222,474.

Based upon the average household size of 2.93 persons, in Beaver County, from the 2000 U.S. Census, there are approximately 35 persons at risk from landslide.

Number of People and Buildings/Structures Impacted by Landslide

Table 19 Analysis of Landslide Risk in Beaver County

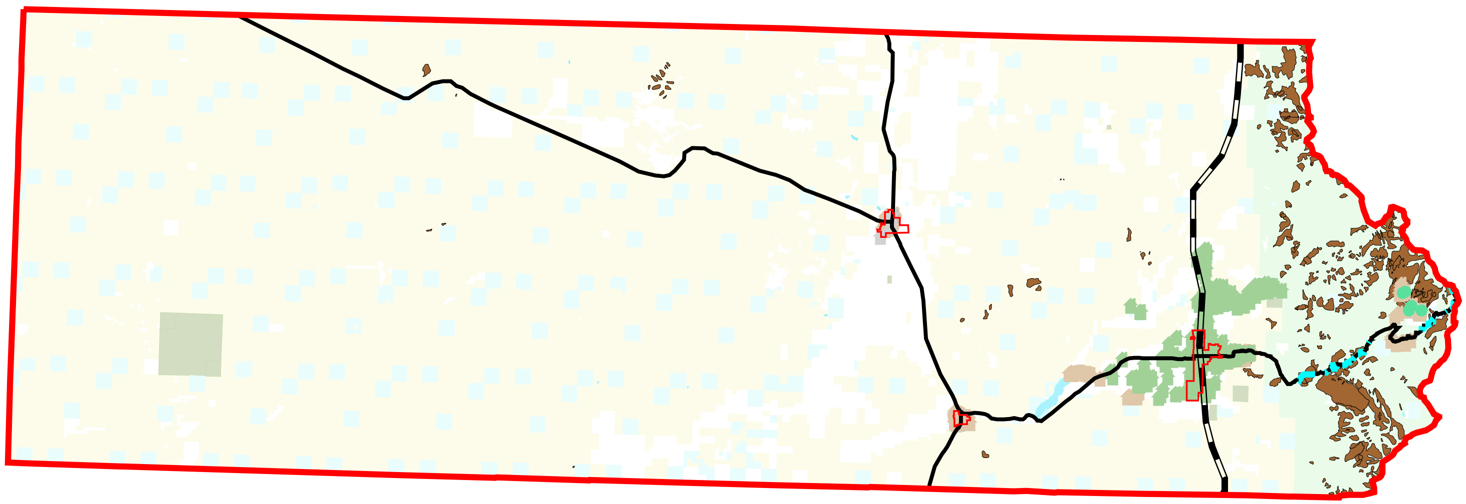
Beaver City – Problem Soils/Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	902	0	0%	$62,438,492	$0	0%	2,454	0	0%
Commercial	131	0	0%	$19,143,467	$0	0%	N/A	N/A	N/A
Total	1033	0	0%	$ 81,581,959	$0	0%	2,454	0	0%

Milford City – Problem Soils/Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	527	0	0%	$26,339,047	$0	0%	1,451	0	0%
Commercial	51	0	0%	$13,161,122	$0	0%	N/A	N/A	N/A
Total	578	0	0%	$39,500,169	$0	0%	1,451	0	0%

Minersville Town - Problem Soils/Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	269	0	0%	$16,661,010	$0	0%	817	0	0%
Commercial	12	0	0%	$824,648	$0	0%	N/A	N/A	N/A
Total	281	0	0%	$17,485,658	$ 0	0%	817	0	0%

Unincorporated Beaver County areas – Problem Soils/Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	764	12	1.57%	$69,754,400	$1,070,400	1.53%	1,283	35	2.73%
Commercial	20	2	10%	$2,343,392	$790,645	33.74%	N/A	N/A	N/A
Total	784	14	1.79%	$72,097,792	$1,861,045	2.58%	1,283	35	2.73%

Beaver County
Landslide Map

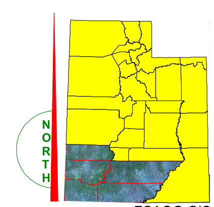


10 0 10 20 Miles

Beaver County Boundary
Towns
Landslides

Major Roads
County Road
Interstate
State Route

* Note: Administrative Ownership is the background layer



FCAOG GIS

Five County Association of Governments August 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Earthquake

HAZUS MH Earthquake Vulnerability Assessment for Beaver County

See Table 20 below for an estimate of earthquake casualties.

Table 20 Earthquake Casualties Risk in Beaver County

Casualties	Nighttime –Minor	48
	Nighttime –Major	1
	Nighttime -Fatalities	2
	Daytime –Minor	45
	Daytime –Major	1
	Daytime- Fatalities	3
	Commute –Minor	40
	Commute –Major	1
	Commute-Fatalities	2

Number of People and Buildings/Structures Impacted by Earthquake

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 21 below lists the number of buildings by occupancy, which is estimated to have moderate to complete levels of damage in Beaver County.

Table 21 Building Damage from Moderate to Complete by Count

Category	Number of Structures	Total Cost in millions of dollars **
Residential	198	51.86
Commercial	5	8.74
Industrial	0	0.94
Totals	1,081*	63.00**

*Includes all building categories with moderate to complete damage
** Structural, non-structural, content, inventory

Table 22 Damage to Critical facilities from Moderate to Complete

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	2	1	0	0
Schools	5	2	0	0
EOCs	0	0	0	0
Police Stations	2	2	0	0
Fire Stations	1	0	0	1

Debris Removal –Table 23 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 23 Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	41
Loads (25 tons per load)	1,640

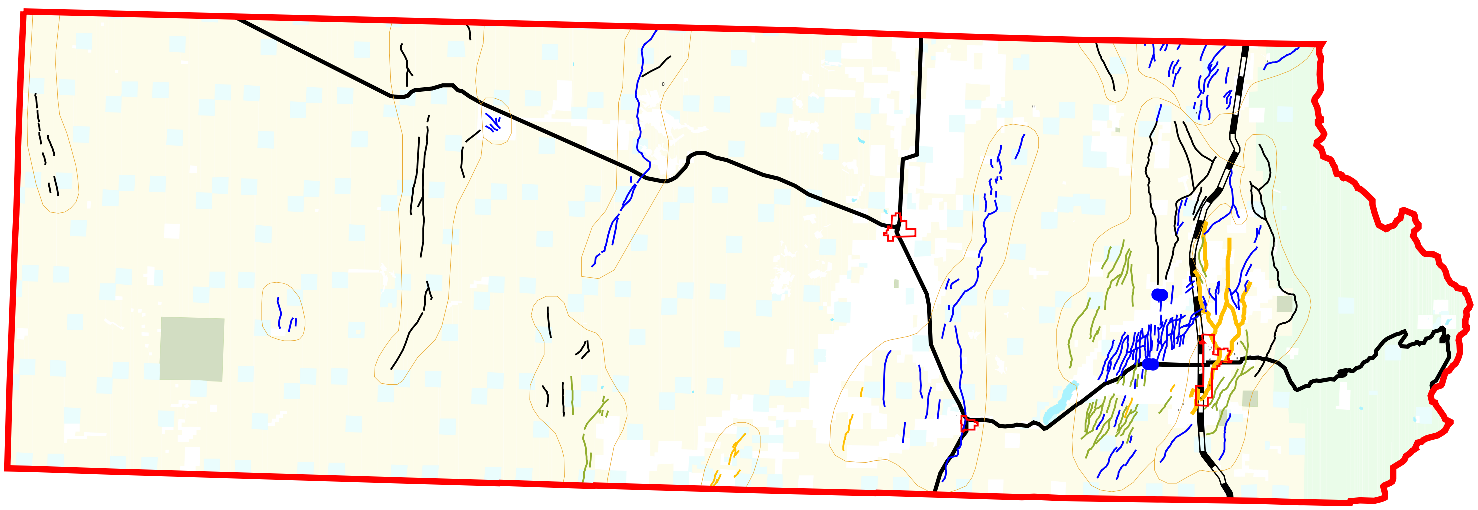
Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 24 below provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 24 Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	1
People Displaced	0
Value Exposed (mill. $)	0

These numbers were derived from a HAZUS MH run based on a probabilistic 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete HAZUS MH run performed by the Utah Division of Emergency Services and Homeland Security is available at the Five County Association of Governments.

Beaver County
Earthquake Map



6 0 6 12 18 Miles

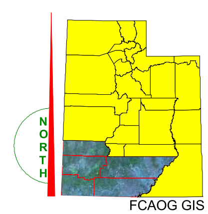
County Boundaries
Towns

Major Roads
I-15
State Route
US Route
Fault Groups

Folds

Fault Lines
123 = Latest Quaternary (<15,000 years)
124 = Latest Quaternary (<15,000 years)
133 = Late Quaternary (<130,000 years)
134 = Late Quaternary (<130,000 years)
144 = Mid to Late Quaternary (<750,000 years)
154 = Quaternary (<1,600,000 years)

* Note: Administrative Ownership is the background layer



Five County Association of Governments September 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Flood

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe depending on location.
Duration: range from very short duration flash flooding to longer-term inundation. Duration varies by location.

Assessing Vulnerability: Identifying Assets and Estimating Losses

Overall Summary of Impacts

Based upon review of available data, in Beaver City there are two residential structures located in a Floodplain (A Zone). Based upon an average value of residential structures in Beaver County, the market value of those two structures is approximately $138,752. Based an average household size (U.S. Census Bureau, Census 2000) of 2.84 per household, there are approximately 6 persons at risk from floodplains. See Table 25 below for an analysis of flood risk in Beaver County.

Number of People and Buildings/Structures Impacted by Floodplains

Table 25 Analysis of Flood Risk in Beaver County

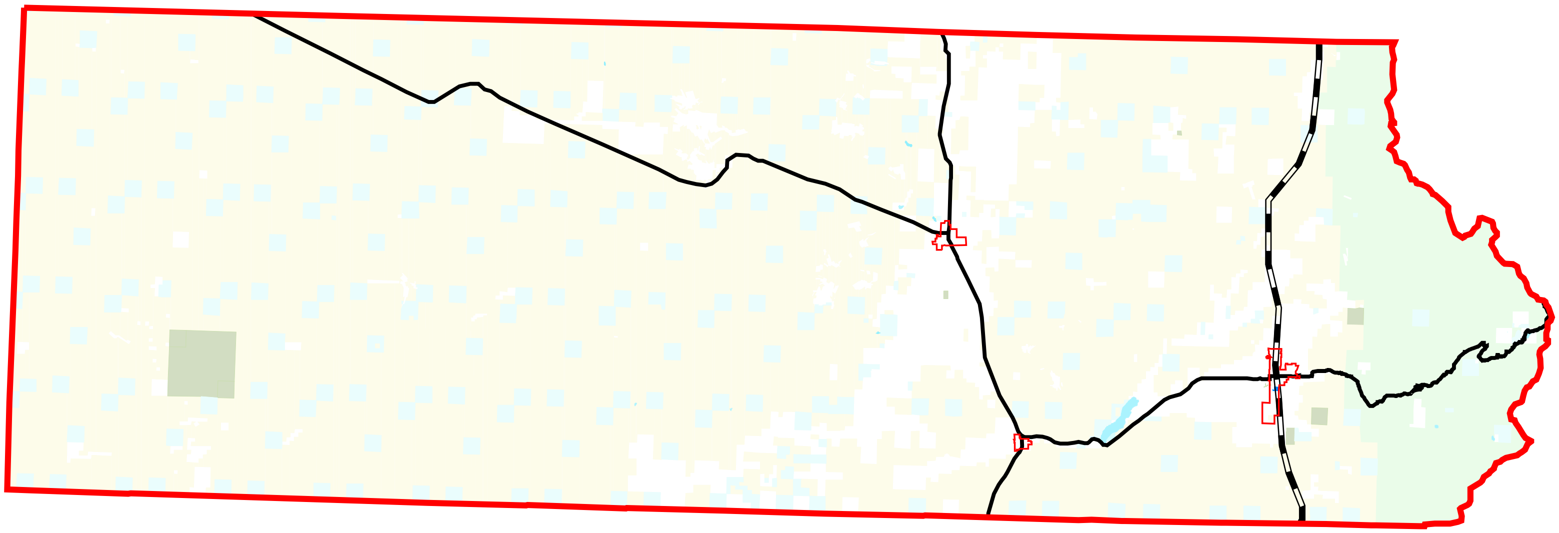
Beaver City – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	902	2	0.22 %	$62,438,492	$138,752	0.22%	2,454	6	0.24%
Commercial	131	0	0%	$19,143,467	$0	0%	N/A	N/A	N/A
Total	1033	2	0.19 %	$ 81,581,959	$138,752	0.17%	2,454	6	0.24%

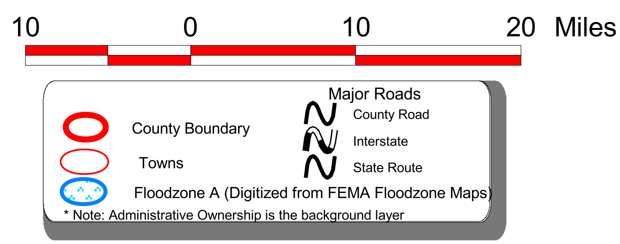
Milford City – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	527	0	0%	$26,339,047	$0	0%	1,451	0	0%
Commercial	51	0	0%	$13,161,122	$0	0%	N/A	N/A	N/A
Total	578	0	0%	$39,500,169	$0	0%	1,451	0	0%

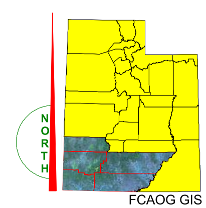
Minersville Town - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	269	0	0%	$16,661,010	$0	0%	817	0	0%
Commercial	12	0	0%	$824,648	$0	0%	N/A	N/A	N/A
Total	281	0	0%	$17,485,658	$ 0	0%	817	0	0%

Unincorporated Beaver County areas – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	764	0	0%	$69,754,400	$0	0%	1,283	0	0%
Commercial	20	0	0%	$2,343,392	$0	0%	N/A	N/A	N/A
Total	784	0	0%	$72,097,792	$0	0%	1,283	0	0%

Beaver County
Floodzone Map





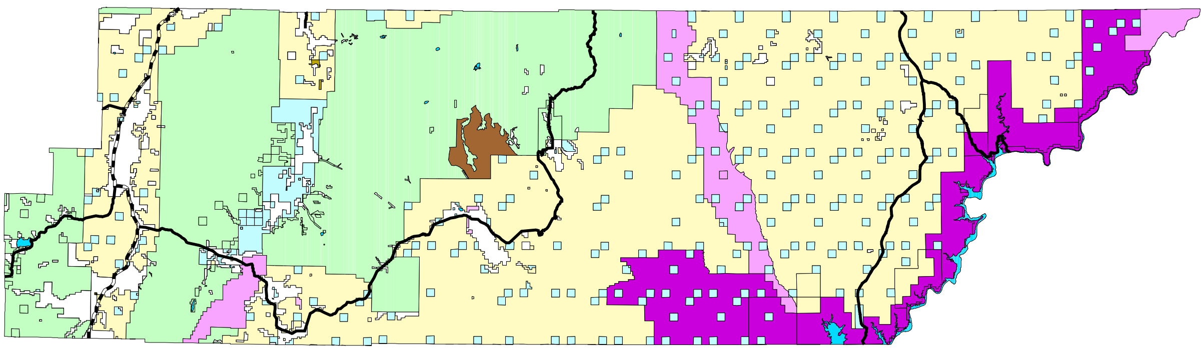


Five County Association of Governments September 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Garfield County



History

After the occupation of Central Mexico by Spaniards in 1514, several exploratory trips were made to the north. Marco de Niza, accompanied by three priests and others, made a successful trip and returned to interest Coronado - then President of New Spain - in this area. He then dispatched expeditions into this and surrounding regions.

Garcia Lopez de Gardenas was undoubtedly the first man to see any part of the Colorado Canyon. Many expeditions followed; and on July 29, 1776, a party headed by Silvestre Valdez Escalante made a memorable trip. From the descriptions, left by that party, their route is easily traced. Their records give the first information about the part of Garfield County near Cannonville, Boulder, and Escalante. On September 26th, they reached the Colorado River; and after 12 days' search, a point was found where a crossing was made. This spot has since been known as "The Crossing of the Fathers".

So far as is known, Father Escalante was the first white man to traverse Southern Utah and the only explorer to enter Glen Canyon before Powell's memorable trip nearly a century later. Major J. W. Powell, a scientific explorer, was engaged by the Smithsonian Institute in 1867-69 to explore Western Colorado and Eastern Utah; and due to his several expeditions, we have much geographical knowledge of this area.

Thompson, one of Powell's associates, describes eastern Garfield County with this statement: "A large portion of this area is naked sandstone rock, traversed in all directions by perfect labyrinth of narrow gorges, sometimes seeming to cross each other, but finally uniting in a principal one....the Colorado."

In 1870 Southeastern Utah, comprising about a quarter of the state, was unknown land. Powell had marked the course of the Colorado, but found no feasible route leading from it except those already known. Explorations by scouts of the Mormon Church had resulted in locating small tracts of irrigatable land at the east base of the high plateaus, along the Paria River, and at places south of the Colorado Canyons. Paria was founded in 1871; Cannonville and Escalante in 1875. Paria (Pah-water, reah-deer) on the Paria River is the oldest settlement in South Central Utah. Paria, Adairville, Rockhouse, Georgetown and Clifton have been abandoned because of the scarcity of water and the destruction by floods. Only three county communities exist in this area today - Cannonville, Tropic and Henrieville.

The Mormon expeditions played an important role in the exploration and settling of this area, and a study of Church records tell of early settlers and their experiences here. Most notable is the trek of a group of 200 men, women and 50 children, with 200 horses and 1,000 cattle, who left Iron County and crossed Garfield County. This expedition was in search of a shorter route to San Juan County. After reaching the rim of the canyon of the Colorado River, one of Utah's greatest pioneering feats was accomplished. Rocks were blasted away, wagons, and cattle and pioneers laboriously made their way to the bottom of the Colorado, where the river crossing was made in February. Even today, to view the "Hole in the Rock" where the crossing was made, makes one realize that this feat would seem an utter impossibility.

In 1880, another site to cross the Colorado was located to satisfy the need for a more convenient crossing of the river. The spot selected is known as Hite. For many years a ferry was operated there. A bridge now connects the roads on each side of the Colorado River. About 50 miles downstream from Hite a ferry crosses the river to connect Garfield and San Juan Counties.

Garfield county is an area fabulously wealthy in scenic beauty, providing the nature lover, explorer, geologist, prospector, and historian with a great challenge to read and understand the character of mother nature.

The largest employer in Garfield County include hotel and lodging places of Ruby's Inn incorporated. Governmental agencies including the Garfield County School District, Garfield County, Garfield Memorial Hospital, the Motor Vehicle Division, and the National Park Service are also among the major employers.

Private land ownership in Garfield is small as a percentage of total land in the County. See table 26 below:

Table 26 Garfield County Land Ownership

Land Ownership:	Acres	County Percentage
BLM	1,450,391	43.0
Forest Service	1,045,974	31.0
National Park Service	434,147	12.9
Bureau of Reclamation	39,007	1.1
Utah State Trust Lands	269,614	8.0
Private Lands	133,584	4.0
Totals	3,372,717	100

Panguitch, the Garfield County seat is centrally located to many National Parks and metropolitan areas in the West.

Denver, Colorado - 516
Grand Canyon North Rim - 145
Grand Canyon South Rim - 280
Helena, Montana - 719
Jackson, Wyoming - 511
Las Vegas, Nevada - 234
Monument Valley - 369
Page, Arizona - 139
St. George, Utah - 115
Salt Lake City, Utah - 236
Yellowstone National Park - 531
Zion National Park - 73

The average temperature in January is 24º F, and the average July Temperature is 66º F. Annual Average Precipitation is 10.3".

Development Trends

The national recession and the aftereffects of September 11, 2001 took a definite swipe at Garfield County's tourism-dependent economy during late 2001 and 2002. Jobs took a hit and correspondingly, unemployment rates hitched up a notch. Other economic indicators fared poorly, too. Construction values dropped and gross taxable sales showed the first decrease in more than a decade.

Population
After experiencing net out-migration in the 1950s and 1960s, Garfield County has typically shown population growth rates hovering between the state and national averages. In the most current decade, Garfield County's population grew 19 percent—a rate lower than more than half of Utah's counties. Still, Garfield County population growth outpaced the national 13-percent growth rate. However, population estimates for 2001 alone suggest that Garfield County once again experienced out-migration.

In the 1990s, Garfield County population grew fastest in Antimony. Escalante showed not net change in population while Henrieville lost a few residents. Panguitch added the highest number of new residents between 1990 and 2000. However, most population growth occurred outside the major townships.

Demographics
One of the more noticeable changes over the past decade was the increase in Garfield County's Hispanic population. In 1990, 1.5 percent of the county's population was Hispanic. By 2000, that share had increased to 2.3 percent. Still, Garfield County remains much less racially and ethnically diverse than the state and the nation. Only 6 percent of the county's population is nonwhite or Hispanic compared to 31 percent nationally and 15 percent in Utah. Over the past 10 years, Garfield County retained its larger-than-average share of the population. The county's share of "seniors" (14 percent) measures substantially above both the Utah (9 percent) and U.S. (12 percent) shares. On the other hand, Garfield County still shows a higher percentage of the population under the age of 18 than does the nation. This population distribution means Garfield County has a small proportion of working-age adults "supporting" its seniors and children. Only 53 percent of the county's population was between the ages of 18 and 65 compared to 62 percent nationally.

Over the last decade, household size decreased slightly from an average of 3.00 persons to 2.92 persons. Nevertheless, Garfield County families are more likely than Utah or U.S. families to be headed by a married couple. Female-headed families with children also make up a smaller share of Garfield County families than in the state or the nation.

In terms of 2000 educational attainment, 86 percent of the county's adults (over 25 years of age) have graduated from high school—an improvement from 1990, but still below the state average. Not surprisingly for a nonurban area, Garfield County also showed a smaller share of college graduates than the state and nation. Nevertheless, 20 percent of the county's adults have at least a college degree—a higher-than average rate for a nonurban county.

The Labor Market
In 2001, Garfield County saw its job totals drop by 1.6 percent. Job growth boomed in 1999 only to face a bust in the wake of recession and decreased travel after the events in September 11, 2001. Both Utah and the United States were still experiencing job growth during 2001. Garfield County typically follows the trend of Utah and U.S. job growth—with higher peaks and lower valleys. However, not every industry suffered job losses. In fact, construction and transportation/communications/utilities employment showed healthy improvements. Even trade and government showed some expansion.

Yet during 2001, Garfield County experienced a net decrease of roughly 30 jobs. Declines in services industry employment, which includes hotels and motels, was the primary impetus behind Garfield County's overall employment decline. The job losses did take their toll in a decidedly higher unemployment rate. During 2001, Garfield County's unemployment rate reached 9.2 percent - the highest level in six years. Because of the seasonal nature of Garfield County's economy which leaves many workers unemployed during the "off season," Garfield County's jobless rate remains perennially high. During 2001, Garfield County showed the second highest jobless rate in the state.

Data from Census 2000 shows that Garfield County's labor force participation increased during the 1990s. This change was probably due to a rise in the proportion of women who work outside the home. Mothers are certainly working more. Almost 70 percent of children under six in Garfield County have both parents in the labor force.

Wages and Income

As in many non-urban areas, wages in Garfield County are relatively low. With an average monthly wage of $1,575 in 2001, Garfield County ranks in the bottom fourth of Utah's counties. The county's average wage measured only 64 percent of the state average. And, this figure has trended downward since the late 80s when Garfield County's average wage measured 74 percent of the state average. Moreover, in 2001, wages increased by less than 2 percent— not even enough to keep up with sluggish inflation.

Mining is the highest-paying industry in the county—but this industry employs very few workers. In comparison with statewide industries, mining, transportation/communications/utilities and government workers' wages most closely approximate their Utah counterparts. This industry typically pays between 80 and 85 percent of the state average. Trade showed the lowest average wage because many trade jobs are part-time and low-pay. Measures of income (which includes interest income, rental income, business income, government payments such as Social Security and welfare, as well as wages) show a similar picture. Median family income ($40,200) ranks well below state ($51,000) and national ($50,000) averages. And in terms of per capita personal income, Garfield County again ranks in the bottom fourth of the state. Yet, surprisingly, only 8 percent of Garfield County's population is considered to be living in poverty—lower than both state and national averages. The poverty rate dropped dramatically from 15 percent in 1990 to only 8 percent in 2001.

Other indicators

Construction values took a nosedive during 2001 dropping 43 percent when compared to 2000. Every construction category showed a drop with home building dropping by almost one fifth. However, commercial/nonresidential building slowdown proved most dramatic with an 87-percent decrease.

The gross taxable sales figures added to the sense of economic malaise. In comparison to 2000, sales in 2001 dropped by 9 percent—the first decline in more than a decade. This decline wasn't focused in just one area. Nearly all sales categories showed marked sales declines.

Conclusions

All in all, recession and September 11, 2001 took a bite out of Garfield County's economy. Jobs dropped, unemployment went up, construction slowed and sales dropped. However, preliminary indicators suggest that better years ahead for tourism in Utah than in many areas which should translate to a healthier Garfield County economy.

Critical Facilities of Garfield County

A listing of the Critical Facilities of Garfield County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 27 below:

Table 27 Critical Facilities of Garfield County

Name or Description of Asset **Antimony Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Antimony Fire Station	Town	X					data unavail.	$unknown	
Antimony School	Garfield County School District	X					2,767 sq. ft.	$249,638	
Water Tank	Town	X					data unavail.	$unknown	

Name or Description of Asset **Boulder Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Boulder Fire Station	Boulder Town	X					data unavail.	$unknown	
Boulder School	Boulder Town	X					data unavail.	$unknown	
Boulder Town Hall	Boulder Town	X					data unavail.	$unknown	
Water Tank	Boulder Town	X					data unavail.	$unknown	

Name or Description of Asset **Cannonville Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Cannonville Town Office/ Medical Clinic		X					data unavail.	$unknown	

Name or Description of Asset **Escalante City**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Escalante Clinic	Escalante City	X	X		X		1,620 sq. ft.	$75,000	
Escalante Fire Station	Escalante City	X					2,800 sq. ft.	$ 200,000	
Escalante Police Station/Library	Escalante City	X					4,900 sq. ft.	$75,000	
Escalante Community Center	Escalante City	X					7,400 sq. ft.	$100,000	
Escalante City Office	Escalante City	X					6,650 sq. ft.	$100,000	
Escalante High School	Escalante City	X					42,000 sq. ft.	$3,897,600	
Airport (Not including runways)	Escalante City	X					2,000 sq. ft.	$75,000	
Water Tank	Escalante City	X					1MG	$750,000	Problem Soils

Name or Description of Asset **Hatch Town**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Hatch Fire Station	Hatch Town	X					data not avail.	$unknown	
Hatch Town Hall	Hatch Town	X					data not avail.	$unknown	
Water Tank	Hatch Town	X					250,000 gallons	$unknown	

Name or Description of Asset **Henrieville Town**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Henrieville Fire Station	FCAOG Consolidated Plan	X					4,800 sq. ft.	$480,000	
Henrieville		X					data	$unknown	

Town Hall							unavail.		
Water Tank		X					data unavail.	$unknown	

Name or Description of Asset **Panguitch City**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Garfield Memorial Hospital	Garfield Memorial Hospital (IHC)	X	X		X		34,118 sq. ft.	$9,000,000	
Panguitch Fire Station	Panguitch City	X					13,200 sq. ft.	$ 550,000	
Panguicth High School	Garfield County School District	X					58,000 sq. ft.	$5,382,400	
Panguitch Airport (Including runways)	Panguitch City	X		X			n/a	$2,500,000	
Water Tank	Panguitch City	X					0.5MG	$400,000	
Water Tank	Panguitch City	X					0.5MG	$400,000	
Water Tank	Panguitch City	X					0.5MG	$400,000	
Panguitch Sewer Lagoons (including pump station)	Panguitch City	X					450 sq. ft. pump station	$2,500,000	
Television Translator	Panguitch City	X					300 sq. ft.	$100,000	
County Courthouse	Garfield County	X				X	not avail.	$unknown	
County Road Shed	Garfield County	X					not. Avail.	$unknown	

Name or Description of Asset **Tropic Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Tropic Fire Station/Town Hall	Tropic Town	X					4,800 sq. ft.	$ 480,530	Floodplain, Soils
Bryce Valley High School	Tropic Town	X					53,000 sq. ft.	$4,918,400	Soils
Water Tank	Tropic Town	X						$ Value not avail. - not insured	Floodplain, Soils
Water Tank	Tropic Town	X						$ Value not avail. - not insured	Floodplain, Soils

Tropic Sewer Lagoons		X			X			$ unknown - not insured	Floodplain

Analysis of Infrastructure in Garfield County

A listing of the Infrastructure of Garfield County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 28 below

Table 28 Critical Infrastructure of Garfield County

Name of Town **Panguitch**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	4	0	4	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	57	1	52	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	253.54	2.19	231.84	.12	.50	0	0	0	0	0	0	0	0	.50
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	0	92.03	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	203.43	.76	196.58	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	46.57	.27	35.96											
Land Slides (sq miles)	415.62	0	415.26											
Problem Soils (sq miles)	1045.20	2.94	1041.9											
Volcanic Flows (sq miles)	32.86	0	32.86											
Wildfires (sq miles)	1448.38	.11	1422.3											

Name of Town Antimony	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	4	0	4	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	57	2	52	0	0	0	0	0	0	0	0	1	0	0
# of Tunnels	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	253.54	2.06	231.84	0	0	0	0	0	0	0	0	1.64	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	4.43	92.03	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	203.43	0	196.58	.17	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	46.57	.07	35.96											
Land Slides (sq miles)	415.62	.28	415.26											
Problem Soils (sq miles)	1045.20	0	1041.9											
Volcanic Flows (sq miles)	32.86	0	32.86											
Wildfires (sq miles)	1448.38	6.73	1422.3											

Name of Town **Boulder**	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	4	0	4	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	57	0	52	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	253.54	9.10	231.84	0	0	0	0	0	0	0	0	4.32	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	0	92.03	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	203.43	1.36	196.58	0	0	0	0	.46	.023	0	0	.91	.046	.069
HAZARDS														
Flood Zones (sq miles)	46.57	0	35.96											
Land Slides (sq miles)	415.62	0	415.26											
Problem Soils (sq miles)	1045.20	0	1041.9											
Volcanic Flows (sq miles)	32.86	00	32.86											
Wildfires (sq miles)	1448.38	12.83	1422.3											

Name of Town **Cannonville**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	4	0	4	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	57	0	52	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	253.54	.40	231.84	.50	2	0	0	0	0	0	0	0	0	2
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	0	92.03	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	203.43	0	196.58	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	46.57	.001	35.96											
Land Slides (sq miles)	415.62	0	415.26											
Problem Soils (sq miles)	1045.20	.01	1041.9											
Volcanic Flows (sq miles)	32.86	00	32.86											
Wildfires (sq miles)	1448.38	.01	1422.3											

Name of Town **Escalante**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	4	0	4	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	57	1	52	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	253.54	1.73	231.84	0	0	0	0	0	0	0	0	.39	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	0	92.03	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	203.43	2.02	196.58	0	0	0	0	0	0	0	0	.82	.041	.041
HAZARDS														
Flood Zones (sq miles)	46.57	.26	35.96											
Land Slides (sq miles)	415.62	0	415.26											
Problem Soils (sq miles)	1045.20	.33	1041.9											
Volcanic Flows (sq miles)	32.86	00	32.86											
Wildfires (sq miles)	1448.38	.56	1422.3											

Name of Town Hatch	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	4	0	4	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	57	0	55	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	253.54	.95	231.84	.23	1	0	0	0	0	0	0	0	0	1
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	0	92.03	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	203.43	.44	196.58	.30	.015	0	0	0	0	0	0	.08	.036	.186
HAZARDS														
Flood Zones (sq miles)	46.57	.09	35.96											
Land Slides (sq miles)	415.62	0	415.26											
Problem Soils (sq miles)	1045.20	0	1041.9											
Volcanic Flows (sq miles)	32.86	00	32.86											
Wildfires (sq miles)	1448.38	.03	1422.3											

Name of Town **Henrieville**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	4	0	4	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	57	0	55	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	253.54	.46	231.84	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	0	92.03	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	203.43	0	196.58	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	46.57	.02	35.96											
Land Slides (sq miles)	415.62	0	415.26											
Problem Soils (sq miles)	1045.20	.02	1041.9											
Volcanic Flows (sq miles)	32.86	00	32.86											
Wildfires (sq miles)	1448.38	0	1422.3											

Name of Town **Tropic**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Coasts in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	4	0	4	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	57	1	52	0	0	0	0	0	0	0	0	0	1	0
# of Tunnels	2	0	2	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	253.54	4.28	231.84	.22	0	1.15	5	1.65	7	0	0	2.56	0	13
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	0	92.03	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	203.43	2.27	196.58	.42	.021	0	0	1.02	.051	0	0	2.27	.114	.645
HAZARDS														
Flood Zones (sq miles)	46.57	.70	35.96											
Land Slides (sq miles)	415.62	.27	415.26											
Problem Soils (sq miles)	1045.20	0	1041.9											
Volcanic Flows (sq miles)	32.86	00	32.86											
Wildfires (sq miles)	1448.38	5.85	1422.3											

Unincorporated Areas of County	**County Total**	**Towns Total**	**Unincorporated**	**FloodZone Unincorporated.**	**Flood Zone Costs in Millions $**	**LandSlide Unincorporated**	**Land Slide Costs in Millions $**	**ProblemSoil Unincorporated**	**Problem Soil Costs in Millions $**	**VolcanicFlow Unincorporated**	**Volcanic Flow Costs in Millions $**	**Wildfire Unincorporated**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	4	0	4	0	0	1	0	0	0	0	0	21	0	0
# of Highway Bridges	57	1	52	1	5	1	5	3	15	1	5	14	0	60
# of Tunnels	2	0	2	0	0	0	0	0	0	0	0	2	0	0
Major Roads (miles)	253.54	4.28	231.84	12.5	50	4	16	15.8	62	0	0	95.6	0	128
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	96.46	0	92.03	4.05	.203	1.15	.056	6.53	.327	5.96	.300	47.5	2.38	3.266
Other Utility Lines (miles)	203.43	2.27	196.58	6.62	.331	6.69	.335	9.10	.455	2.23	.112	102	5.08	6.313
HAZARDS														
Flood Zones (sq miles)	46.57	.70	35.96											
Land Slides (sq miles)	415.62	.27	415.26											
Problem Soils (sq miles)	1045.20	0	1041.9											
Volcanic Flows (sq miles)	32.86	00	32.86											
Wildfires (sq miles)	1448.38	26.11	1422.3											

Wildfire

FEMA Hazard Profile

Frequency: Likely (drought patterns are cyclical)
Severity: Negligible to structures in incorporated communities and Moderate to High to structures in unincorporated Garfield County.
Duration: Containment time varies for each fire.

Assessing Vulnerability: Identifying Assets and Estimating Losses

Overall Summary of Impacts

Wildfires occur every year in the United States. Factors that influence the potential for wildfires include: type, amounts and conditions of fuel supply (vegetation); temperatures; wind conditions; precipitation patterns; humidity levels; topography and the levels of human activity on the land. Fires in areas of heavy vegetation, if not quickly detected and suppressed can quickly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property.

Most rural wildfires result from thunderstorm activity. In addition, other wildfires are started by acts of human carelessness during activities such as controlled burns of forest areas; burning of ditch banks and fields by landowners; recreational activity such as camping, hunting, and other off-road vehicle travel; and use of both legal and illegal fireworks.

The Five County Association of Governments GIS, utilizing available data, has identified residential and commercial structures at moderate or high risk from wildfire. See Table 29 below for an analysis of wildfire risk in Garfield County.

In unincorporated Garfield County there are approximately 166 residential structures at moderate risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of those structures is estimated to be $10,961,604. There are also 18 residential structures at high risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of those structures is estimated to be $1,180,855. Based upon the average household size of 2.92 persons, in unincorporated Garfield County, from the 2000 U.S. Census, there are approximately 537 persons at risk in unincorporated Garfield County from wildfire. This is 51.14% of the 1,050 population of unincorporated Garfield County.

There is one commercial structure in unincorporated Garfield County identified to be in a moderate or high risk area. Based upon figures provided by the Garfield County Assessors Office, the market value of that structure is estimated to be $128,010.

In the town of Antimony there are 16 residential structures at moderate risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of that structure is estimated to be $682,744. There are approximately 47 persons (38.52% of the Town's population) at moderate risk from wildfire.

In the town of Boulder there are 7 residential structures at moderate risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of those structures is estimated to be $408,519. There is one commercial structure in the town of

Boulder at moderate risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of that structure is estimated to be $266,342. There are approximately 19 persons (10.55% of the Town's population) at moderate risk from wildfire.

In Escalante City there are 6 residential structures at moderate risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of those structures is estimated to be $309,846. There are approximately 16 persons (1.95% of the City's population) at moderate risk from wildfire. There are 4 residential structures at high risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of those structures is estimated to be $206,051. There are approximately 11 persons (1.34% of the Town's population) at high risk from wildfire.

In the town of Hatch there are 5 residential structures at moderate risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of that structure is estimated to be $682,744. There are approximately 16 persons (12.59% of the Town's population) at moderate risk from wildfire.

In Panguitch City there are 4 residential structures at moderate risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of that structure is estimated to be $239,772. There are approximately 12 persons (0.73% of the City's population) at moderate risk from wildfire.

In the town of Tropic there are 10 residential structures at moderate risk from wildfire. Based upon figures provided by the Garfield County Assessors Office, the market value of those structures is estimated to be $604,804. There are approximately 32 persons (6.29% of the Town's population) at moderate risk from wildfire.

Number of People and Buildings/Structures Impacted by Wildfire

Table 29 Analysis of Wildfire Risk in Garfield County

Antimony – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	77	16	20.77%	$3,285,707	$682,744	20.77%	122	47	38.52%
Commercial	3	0	0%	$627,060	$0	0%	N/A	N/A	N/A
Total	80	16	20.00%	$3,912,767	$682,744	17.44%	122	47	38.52%

Boulder – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	100	7	7.00%	$5,835,985	$408,519	7.00%	180	19	10.55%
Commercial	3	1	33.33%	$799,027	$266,342	33.33%	N/A	N/A	N/A
Total	103	8	7.76%	$6,635,012	$674,861	10.17%	180	19	10.55%

Cannonville - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	67	0	0%	$3,135,106	$0	0%	148	0	0%
Commercial	2	0	0%	$646,462	$0	0%	N/A	N/A	N/A
Total	69	0	0%	$3,781,568	$0	0%	148	0	0%

Escalante - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	370	10	2.70%	$19,107,312	$515,897	2.70%	818	27	3.30%
Commercial	32	0	0%	$3,103,084	$0	0%	N/A	N/A	N/A
Total	402	10	2.48%	$22,210,396	$515,897	2.32%	818	27	3.30%

Hatch - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	84	5	5.95%	$3,672,260	$218,499	5.95%	127	16	12.59%
Commercial	12	0	0%	$1,736,934	$0	0%	N/A	N/A	N/A
Total	96	5	5.20%	$5,409,194	$218,499	4.03%	127	16	12.59%

Henrieville - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	76	0	0%	$3,479,598	$0	0%	159	0	0%
Commercial	2	0	0%	$24,058	$0	0%	N/A	N/A	N/A
Total	78	0	0%	$3,503,656	$0	0%	159	0	0%

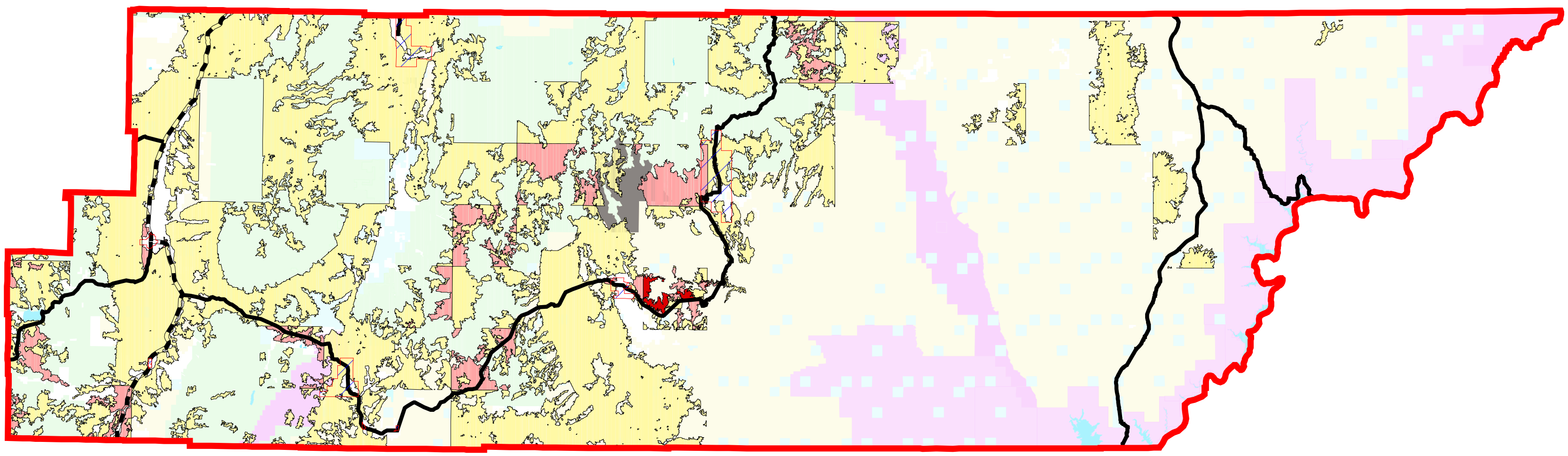
Panguitch - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	613	4	0.65%	$36,888,093	$239,772	0.65%	1,623	12	0.73%
Commercial	62	0	0%	$7,914,526	$0	0%	N/A	N/A	N/A
Total	281	0	0%	$44,802,619	$239,772	0.53%	1,623	12	0.73%

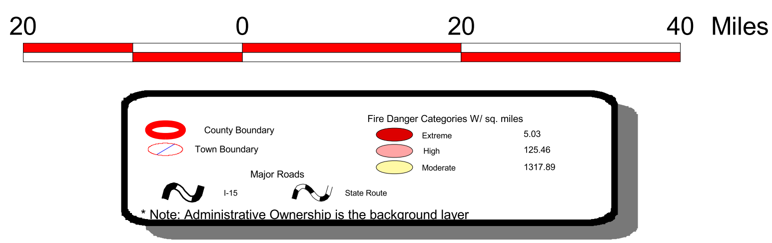
Tropic - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	192	10	5.20%	$11,630,849	$604,804	5.20%	508	32	6.29%
Commercial	18	0	0%	$2,784,009	$0	0%	N/A	N/A	N/A
Total	210	10	4.76%	$14,414,858	$604,804	4.19%	508	32	6.29%

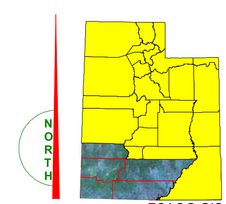
Unincorporated Garfield County areas - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,221	184	15.06%	$80,627,223	$12,142,459	15.06%	1,050	537	51.14%
Commercial	27	1	3.70%	$3,459,742	$128,010	3.70%	N/A	N/A	N/A
Total	1,248	185	14.82%	$84,086,965	$12,270,469	14.59%	1,050	537	51.14%

Garfield County

Wildfire Map







Five County Association of Governments July 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Landslides

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe
Duration: range from very short duration slope failures to long-term ground movement. Duration varies by location.

Assessing Vulnerability

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available data, has identified areas at risk from landslide residential and commercial structures at risk from landslide. See Table 30 below for an analysis of landslide risk in Beaver County

According to the available data, there are no residential structures at risk from landslide in any of the incorporated communities or in unincorporated Garfield County. The same data also indicates that there are no commercial structures at risk from landslide in the county.

Number of People/Buildings Impacted by Landslides

Table 30 Analysis of Landslide Risk in Garfield County

Antimony – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	77	0	0%	$3,285,707	$0	0%	122	0	%
Commercial	3	0	0%	$627,060	$0	0%	N/A	N/A	N/A
Total	80	0	0%	$3,912,767	$0	0%	122	0	%

Boulder – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	100	0	0%	$5,835,985	$0	0%	180	0	%
Commercial	3	0	0%	$799,027	$0	0%	N/A	N/A	N/A
Total	103	0	0%	$6,635,012	$0	0%	180	0	%

Cannonville - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	67	0	0%	$3,135,106	$0	0%	148	0	%
Commercial	2	0	0%	$646,462	$0	0%	N/A	N/A	N/A
Total	69	0	0%	$3,781,568	$0	0%	148	0	%

Escalante - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	370	0	0%	$19,107,312	$0	0%	818	0	%
Commercial	32	0	0%	$3,103,084	$0	0%	N/A	N/A	N/A
Total	402	0	0%	$22,210,396	$0	0%	818	0	%

Hatch - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	84	0	0%	$3,672,260	$0	0%	127	0	%
Commercial	12	0	0%	$1,736,934	$0	0%	N/A	N/A	N/A
Total	96	0	0%	$5,409,194	$0	0%	817	0	0%

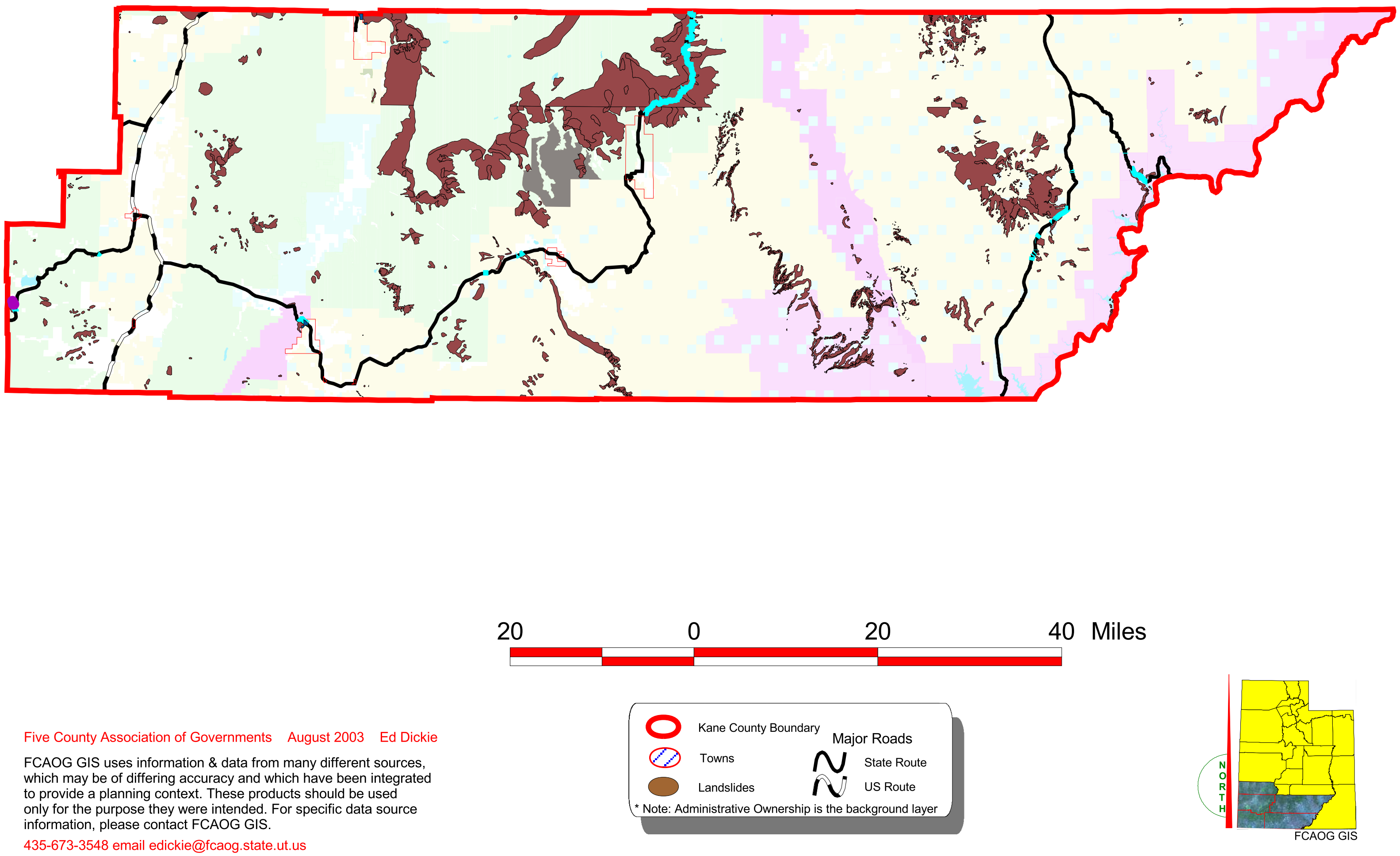
Henrieville - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	76	0	0%	$3,479,598	$0	0%	159	0	%
Commercial	2	0	0%	$24,058	$0	0%	N/A	N/A	N/A
Total	78	0	0%	$3,503,656	$0	0%	159	0	%

Panguitch - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	613	0	0%	$36,888,093	$0	0%	1,623	0	%
Commercial	62	0	0%	$7,914,526	$0	0%	N/A	N/A	N/A
Total	281	0	0%	$44,802,619	$0	0%	1,623	0	%

Tropic - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	192	0	0%	$11,630,849	$0	0%	508	0	%
Commercial	18	0	0%	$2,784,009	$0	0%	N/A	N/A	N/A
Total	210	0	0%	$14,414,858	$0	0%	508	0	%

Unincorporated Garfield County areas - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,221	0	0%	$80,627,223	$0	0%	1,050	0	%
Commercial	27	0	0%	$3,459,742	$0	0%	N/A	N/A	N/A
Total	1248	0	0%	$84,086,965	$0	0%	1,050	0	%

Garfield County
Landslide Map



Five County Association of Governments August 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Earthquake

Assessing Vulnerability and Overall Summary of Impacts

HAZUS MH Earthquake Vulnerability Assessment

See Table 31 below for an estimate of earthquake casualties.

Table 31 Earthquake Casualties Risk in Beaver County

Casualties	Nighttime –Minor	51
	Nighttime –Major	1
	Nighttime -Fatalities	2
	Daytime –Minor	50
	Daytime –Major	2
	Daytime- Fatalities	3
	Commute –Minor	51
	Commute –Major	2
	Commute-Fatalities	3

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 32 below lists the number buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 32 Building Damage from Moderate to Complete by Count

Category	Number of Structures	Total Cost in millions of dollars **
Residential	333	58.47
Commercial	59	20.92
Industrial	0	0.47
Totals	1,346*	80.96**

*****Includes all building categories with moderate to complete damage
** Structural, non-structural, content, inventory

Table 33 Damage to Critical facilities from Moderate to Complete

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	1	1	0	0
Schools	10	3	0	0
EOCs	0	0	0	0
Police Stations	2	2	0	0
Fire Stations	1	0	0	1

Debris Removal –Table 34 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 34 Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	53
Loads (25 tons per load)	2,120

Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 35 below provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

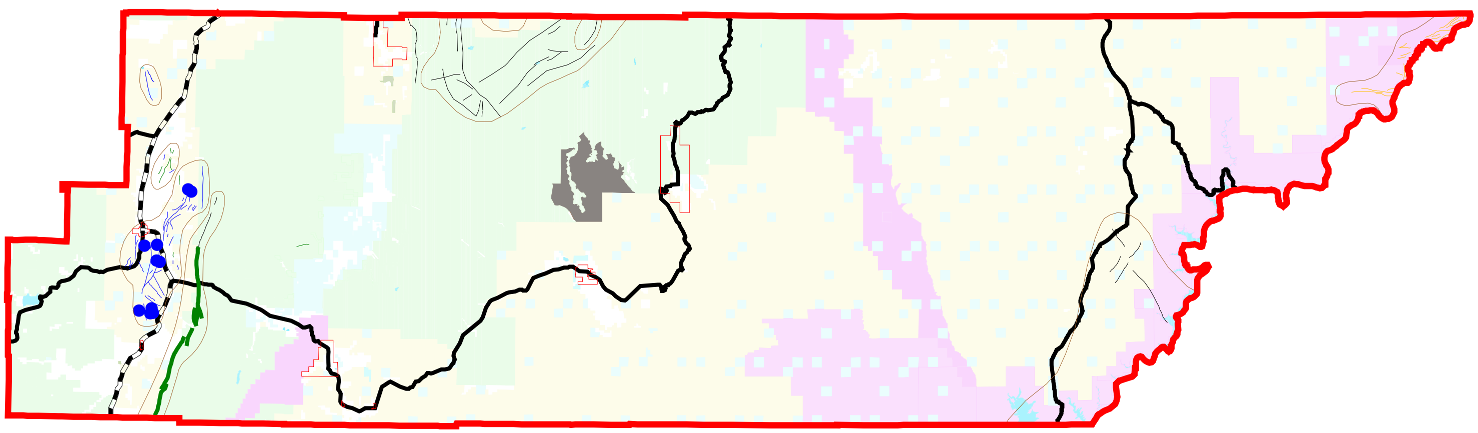
Table 35 Fire Following Event, Population Exposed, and Building Stock Exposed

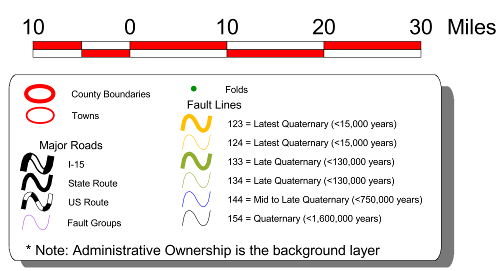
Ignitions	1
People Displaced	0
Value Exposed (mill. $)	0

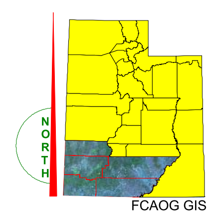
These numbers were derived from a HAZUS MH run based on a probabilistic 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete HAZUS MH run performed by the Utah Division of Emergency Services and Homeland Security is available at the Five County Association of Governments.

Garfield County

Earthquake Map







Five County Association of Governments September 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Flood

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe depending on location.
Duration: range from very short duration flash flooding to longer-term inundation. Duration varies by location.

Garfield County

Number of People and Buildings/Structures Impacted by Floodplains

The Five County Association of Governments GIS, utilizing available floodplain data, has identified residential and commercial structures located within the 100-year floodplain (A Zone). See Table 36 for an analysis of flood risk in Garfield County.

Based upon review of available data, in the town of Antimony there are 4 residential structures located in a Floodplain (A Zone). Based upon an average market value of residential structures in the town, the market value of those structures is approximately $170,686. Based an average household size (U.S. Census Bureau, Census 2000) of 2.95 persons per household in Antimony, there are approximately 12 persons at risk from floodplains.

Based upon review of available data, in Escalante City there are 4 residential structures located in a Floodplain (A Zone). Based upon an average market value of residential structures in Escalante City, the market value of those 4 structures is approximately $206,565. Based an average household size (U.S. Census Bureau, Census 2000) of 2.69 persons per household in Escalante City, there are approximately 11 persons at risk from floodplains.

Based upon review of available data, in Panguitch City there are 62 residential structures located in a Floodplain (A Zone). Based upon an average market value of residential structures in Panguitch City, the market value of those 62 structures is approximately $3,730,932. Based an average household size (U.S. Census Bureau, Census 2000) of 3.05 persons per household in Panguitch City, there are approximately 189 persons at risk from floodplains.

Based upon review of available data, in the town of Hatch there are 26 residential structures located in a Floodplain (A Zone). Based upon an average market value of residential structures in the town, the market value of those structures is approximately $1,136,651. Based an average household size (U.S. Census Bureau, Census 2000) of 3.10 persons per household in Hatch, there are approximately 81 persons at risk from floodplains.

Based upon review of available data, in the town of Tropic there are 22 residential structures located in a Floodplain (A Zone). Based upon an average market value of residential structures in the town, the market value of those structures is approximately $1,332,701. Based an average household size (U.S. Census Bureau, Census 2000) of 3.18 persons per household in Tropic, there are approximately 70 persons at risk from floodplains.

Based upon review of available data, in unincorporated Garfield County there are 64 residential structures located in a Floodplain (A Zone). Sixty-two of these structures are located in unincorporated areas surrounding or near to Panguitch City. The other two structures are located just south of the town of Hatch. Based upon an average market value of residential structures in unincorporated Garfield County, the market value of those structures is approximately $4,226,610. Based an average household size (U.S. Census Bureau, Census 2000) of 2.92 persons per household in Garfield County, there are approximately 187 persons at risk from floodplains.

Table 36 Analysis of Flood Risk in Garfield County

Antimony – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	77	4	5.19%	$3,285,707	$170,686	5.19%	122	12	9.83%
Commercial	3	0	0%	$627,060	$0	0%	N/A	N/A	N/A
Total	80	4	5.00%	$3,912,767	$170,686	4.36%	122	12	9.83%

Boulder – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	100	0	0%	$5,835,985	$0	0%	180	0	0%
Commercial	3	0	0%	$799,027	$0	0%	N/A	N/A	N/A
Total	103	0	0%	$6,635,012	$0	0%	180	0	0%

Cannonville - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area

Residential	67	0	0%	$3,135,106	$0	0%	148	0	0%
Commercial	2	0	0%	$646,462	$0	0%	N/A	N/A	N/A
Total	69	0	0%	$3,781,568	$0	0%	148	0	0%

Escalante - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	370	4	1.08%	$19,107,312	$206,565	1.08%	818	11	1.34%
Commercial	32	0	0%	$3,103,084	$0	0%	N/A	N/A	N/A
Total	402	4	0.99%	$22,210,396	$220,998	0.99%	818	11	1.34%

Hatch - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	84	26	30.95%	$3,672,260	$1,136,651	30.95%	127	81	63.78%
Commercial	12	0	0%	$1,736,934	$0	0%	N/A	N/A	N/A
Total	96	26	27.08%	$5,409,194	$1,136,651	21.01%	127	81	63.78%

Henrieville - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	76	0	0%	$3,479,598	$0	0%	159	0	0%
Commercial	2	0	0%	$24,058	$0	0%	N/A	N/A	N/A
Total	78	0	0%	$3,503,656	$0	0%	159	0	0%

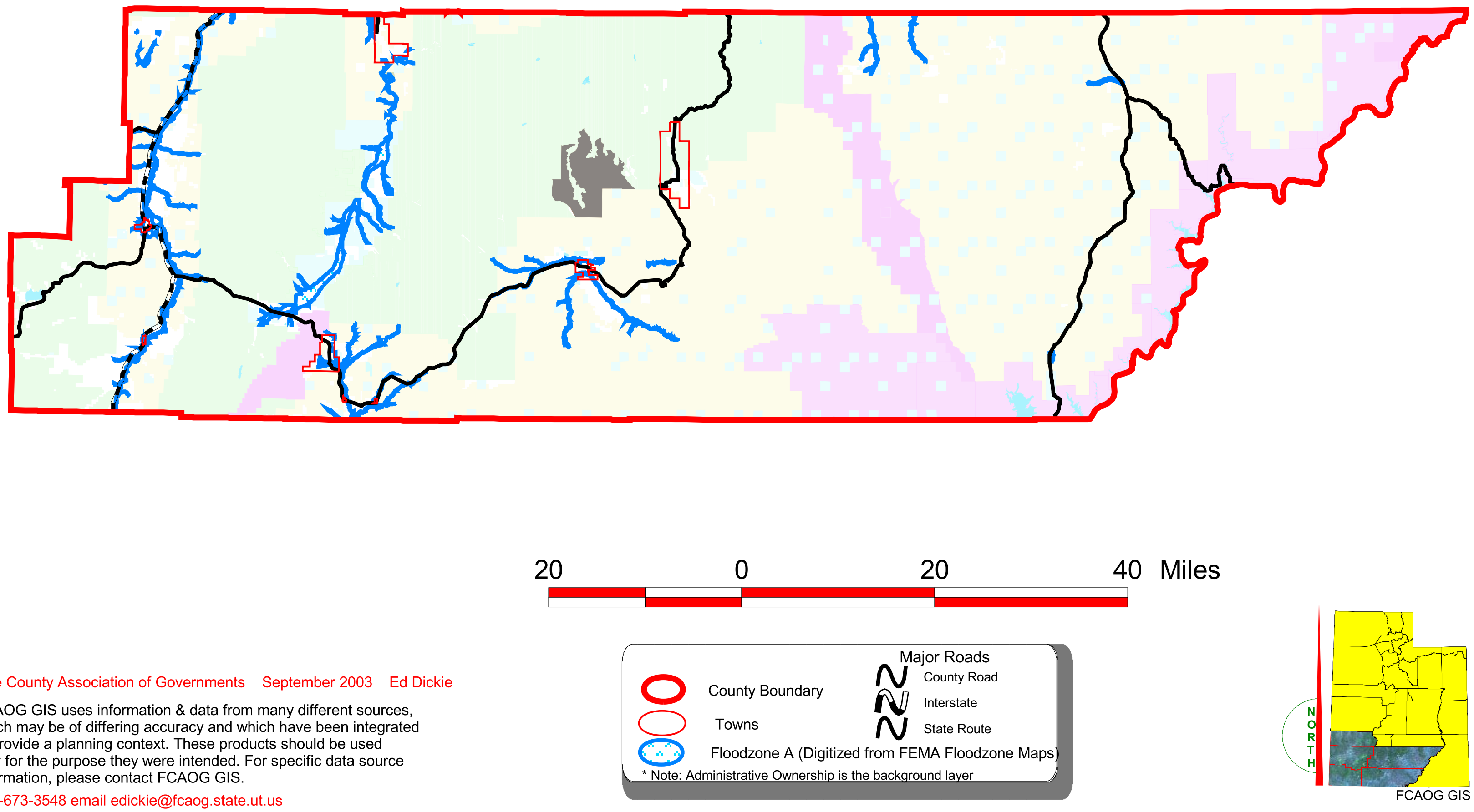
Panguitch - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	613	62	10.11 %	$36,888,093	$3,730,932	10.11%	1,623	189	11.64%
Commercial	62	0	0%	$7,914,526	$0	0%	N/A	N/A	N/A
Total	675	62	9.18%	$44,802,619	$3,730,932	8.32%	1,623	0	11.64%

Tropic - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	192	22	11.45%	$11,630,849	$1,332,701	11.45%	508	70	13.78%
Commercial	18	4	22.22%	$2,784,009	$618,668	22.22%	N/A	N/A	N/A
Total	210	26	12.38%	$14,414,858	$1,951,369	13.53%	508	70	13.78%

Unincorporated Garfield County areas - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,221	64	5.24%	$80,627,223	$4,226,160	5.24%	1,050	187	17.81%
Commercial	27	0	0%	$3,459,742	$0	0%	N/A	N/A	N/A
Total	1,248	64	5.12%	$84,086,965	$4,226,160	5.02%	1,050	187	17.81%

Garfield County

Floodzone Map

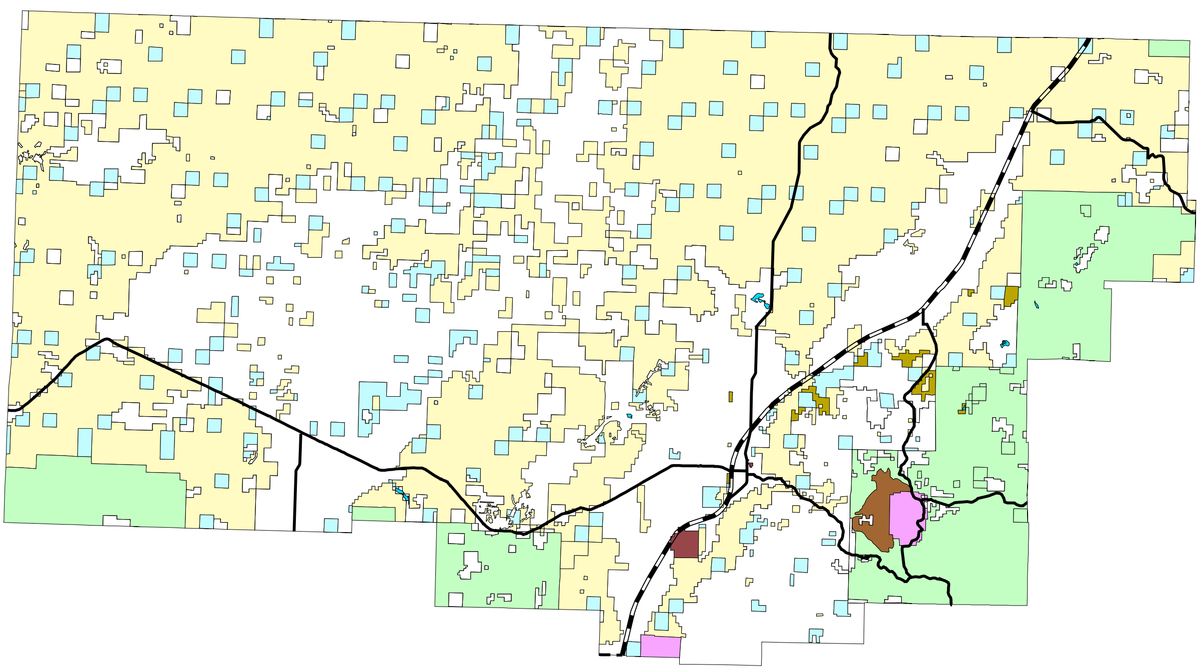


Five County Association of Governments September 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Iron County



History

When Iron County was first established in 1850, it included land in what is now Nevada on the west and part of Colorado on the east. In February 1882 more than half of the eastern domain was organized as Garfield County. Today, the county is bordered on the north by Beaver County, on the south by Washington County, on the east by Kane and Garfield Counties and on the west by the State of Nevada.

Ages ago, geologists say that nature, in one tremendous convulsion or a series of quakes, wrenched the valley floor away from the high plateaus country, some 20 miles south and east, dropping it to a level of 6000 feet. This left the mammoth plateau, as it is called, at an elevation of 10,000 to 11,000 feet and climaxed at Brian Head Peak, some 12,000 feet above sea level.

The several canyons and ridges, cut by the process of erosion, leading downward off the mammoth to the valley floor below, are incomparable in their beauty. Streams of water, grasslands, trees, small lakes and rainbow-colored cliff formations make up a paradise for the fistherman, hunter, hiker or casual visitor.

The Mammoth Plateau comprises hundreds of meadow and forest lands. It slopes gently downward toward the Panguitch Lake and Highway 89 on the east, to Zion National Park area on the south, and on the west breaks sharply downward some 3500 feet in glorious monolithic cliff formations of pink, red, orange, white and all other colors of the rainbow. This and a wide adjoining area of grass and forest land has been set aside by the Federal Government as Cedar Breaks National Monument.

Highway 143 leaves Parowan and makes a semicircle up to Brian Head and Cedar Breaks and down Cedar Canyon to Cedar City for the most rewarding hour drive anyone could take. It makes its way up scenic Parowan Canyon onto the Mammoth Plateau "up on top" where the road skirts the rim of Cedar Breaks National Monument and down to Cedar City. If one has several hours to relax and view beautiful scenery, he may travel up the canyons. The first left-hand fork contains one of the finest of forest camp grounds. This is adjacent to such points of interest as Noah's Ark and Jacob's Well, the Grand Castle with the Grim Old Giants guarding it, Alum Cove and the Walls of Jericho. Second left-hand canyon and Main Canyon also lead upward to the Mammoth Plateau and have fishing streams, grass lands, giant pine and quaking aspen, deer and smaller wildlife throughout the area.

Parowan, the Iron County seat is located along the I-15 corridor. Parowan proximity to some other Utah cities is shown below

Salt Lake City - 238 miles
Moab - 273 miles
Green River - 221 miles
St. George - 68 miles

The average temperature for the county seat, Parowan, in January is 42º F, and the average July temperature is 90º F. Annual Average Precipitation is 10". The temperatures in other communities in Iron County vary somewhat, however, the town of Brian Head is much cooler winter and summer due to its mountainous location.

Development Trends

Despite feeling the effects of the national slowdown, Iron County managed to end 2000 in a healthy state. The county did lose employment in the "goods-producing industries". However, the best county-level indicator of economic wellbeing, growth in non-farm jobs, showed moderate expansion, unemployment remained low, construction picked up slightly, and sales increased. However, as the national slowdown continues, Iron County will be susceptible to economic deterioration.

Population

For most of the last half-century, population growth in Iron County has mirrored state expansion rates. That trend ended in the 1990s when the population of Iron County exploded. Just how fast was the population growth? Figures from Census 2000 tell us that roughly 33,800 individuals lived in Iron County during 2000. That represents a 63% decade increase in population. In fact, Iron County was the third fastest growing county in Utah during the 1990s. Iron County's had a 63% expansion in population versus a 30% growth in Utah's population between 1990 and 2000. And, the U.S. expansion measured a mere 13% while Enoch experienced the most rapid population boom between 1990 and 2000 (almost 80%). Cedar City continued to attract the most new residents. Brian Head was the slowest growing community in the county with a population increase of only 8%. One of the most interesting trends was the rapid population growth outside the county's major townships.

Demographics

One of the more startling changes the Census revealed was an increase in Iron County's Hispanic population. In 1990, less than 2% of the county's population was Hispanic. By 2000, that share had increased to more than 4%. Still, Iron County has not become a hotbed of diversity. Only 9% of the county's population is nonwhite or Hispanic compared to 31% nationally. Unlike many communities, Iron County has not seen a significant aging of its population. Census data shows that 9% percent of the county's population is over the age of 65—less than the 10% registered in 1990. Iron County's population is indeed heavy on the young side. Roughly 31% of the population is 18 years old or younger compared to 26% nationally. On the other hand, Iron County's population distribution is fairly similar to Utah's except for a bulge in the college-age population. That fact is hardly surprising given the presence of Southern Utah University.

Iron County's household size has decreased slightly over the 1990s. However, Iron County families are more likely than Utah or U.S. families to be headed by a married couple. Moreover, only 7% of the county's families are headed by women with children compared to 8% in Utah and 11% nationally.

The Labor Market

With annual job growth of 3.1% during 2000, Iron County surpassed the employment expansion rates of both Utah and the United States. Iron County accomplished this feat despite losing employment in all of its goods producing industries—mining, manufacturing, and construction. Most of the county's 430 net new jobs were created in services—in particular, business services. Government was the only other major producer of new jobs during 2000. The university and local government generated most of these new public sector positions.

The manufacturing industry lost more than 100 jobs. Keeping in mind that these 2000 figures do not include the O'Sullivan plant closure in January 2001. In other words, expect manufacturing figures to worsen. Construction employment dropped by almost 60 positions. Iron County has experienced a very tight labor market for several years. The increase early in 2001 may actually help ease a difficult labor market situation for employers seeking new workers.

Wages and Income

Along with the decline in Iron County goods producing jobs another flaw appears on the economic horizon. However, this flaw is one of long-standing rather than a recent event. Like many counties outside the sphere of the Wasatch Front, Iron County suffers from lower-than-average wages. In 2000, the county's average monthly non farm wage ($1,629) measured only 68% of the state average. And, this percentage measured at its lowest in more than a decade. Currently, Iron County's average monthly wage places it in the bottom third when all Utah counties are ranked. Despite a larger-than-average manufacturing sector, Iron County wages remain low. The abundance of a young college-age workforce fosters these low wages. Even the expanding economy works to keep wages low—particularly when the new jobs are in services or retail trade. When new firms enter the area or expand, they often hire at the bottom of their pay scales. In addition, the average Iron County worker's wages grew by only 1% during 2000. This means average wage growth didn't even keep pace with inflation. However, not all forms of compensation can be measured in dollars. Obviously, many workers are willing to forgo higher wages to enjoy the quality of life in the county.

Transportation/Communications/Utilities is the highest-paying industry in the county. Trade and services have the lowest average wages because many are part-time and low-pay. All Iron County industries show lower average wages than Utah. With wages at 96% of the state average, transportation/communications/utilities wages most closely approximate the state's figures. Measures of income (which includes interest income, rental income, business income, government payments such as Social Security and welfare, as well as wages) show a similarly dismal picture. Moreover, median household income figures rank below state and national averages. In terms of per capita personal income, Iron County again ranks in the bottom one-third of counties. Not surprisingly, Iron County estimates of poverty (16%) register higher than the averages for both Utah and the United States.

Other indicators

Construction bolstered Iron County's economic position during 2000. Residential permit values rose to the highest level since 1995, and the number of permits issued actually increased. Permitting data shows that the majority of residential growth is still occurring in Cedar City. However, sizeable expansion is appearing outside the county's major cities and towns. Nonresidential construction received a nice boost from the construction of the retail and public-sector buildings. The value of commercial building grew by more than 50% between 1999 and 2000 and marks the highest level since 1992. Growth in sales has proved fairly erratic in Iron County over the past decade. In 2000, the county produced a very mediocre expansion rate of 3.3%. All in all, Iron County's economy continued to hold its own during 2000. Moreover, it did this despite losing a substantial number of jobs. However, Iron County has already felt the effects of the national downturn and will do so in the future. In addition, lower-than-average wages continue to characterize the area.

Critical Facilities of Iron County

A listing of the Critical Facilities of Iron County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 37 below:

Table 37 Critical Facilities of Iron County

Name or Description of Asset **Brian Head Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Brian Head Clinic/Medical Facility	Private Facility (Not under town ownership)	X					un-known	$unknown	Wildfire, Landslide
Brian Head Fire Station	Brian Head Town	X					2,800 sq. ft.	$406,000	Wildfire, Landslide
Brian Head Police Station	Brian Head Town	X					1,500 sq. ft.	$220,000	Wildfire, Landslide
Brian Head Town Hall	Brian Head Town	X					7,600 sq. ft.	$970,000	Wildfire
Brian Head Million Gallon Water Tank	Brian Head Town	X					1MG	$1,100,000	Wildfire, Landslide
Brian Head Half Million Water Tank	Brian Head Town	X					0.5MG	$550,000	Landslide
Brian Head Salt Pile Water Tank	Brian Head Town	X					0.4MG	$450,000	Wildfire, Landslide
Brian Head Redwood Water Tank	Brian Head Town	X					0.3MG	$400,000	Landslide

Name or Description of Asset **Cedar City City**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Cedar City Regional Airport (including Runways)	Cedar City	X		X			7,500 sq. ft.	$75,000,000	Floodplain
Canyon View High School	Cedar City	X					230,000 sq. ft.	$21,344,000	Floodplain
Southern Utah University	Cedar City	X		X		X	Multiple campus buildings	$value of facilities not readily available	

Cedar High School	Cedar City	X					146,886 sq. ft.	$13,631,020	
Valley View Medical Center	Cedar City	X	X	X	X		95,000 sq. ft.	$data not readily available	
Cedar City Fire Station	Cedar City	X					7,850 sq. ft.	$750,000	
Cedar City Fire Station #2	Cedar City	X					4,650 sq. ft.	$525,000	
Cedar City Office Building	Cedar City	X					32,000 sq. ft.	$4,500,000	
4 Water Tanks	Cedar City	X					2.2MG	$650,000	
5 Water Tanks	Cedar City	X					1.9MG	$600,000	
2 Water Tanks	Cedar City	X					1.0MG	$550,000	
Sewer Treatment Facility	Cedar City	X			X		40 acres	$12,500,000	
Heritage Center	Cedar City	X					20,000 sq. ft.	$8,500,000	
Water Wells	Cedar City	X	X	X			9 wells	$1,500,000	

Name or Description of Asset **Enoch Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Enoch Town Hall/Community Center	Enoch City	X					4,242 sq. ft.	$200,000	
Enoch Elementary School	Enoch City	X	X				53,471 sq. ft.	$4,824,153	
Concrete Water Tank	Enoch City	X					2MG	$1,000,000	
Steel Water Tank	Enoch City	X					2MG	$200,000	

Name or Description of Asset **Kanarraville Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Kanarraville	Kanarraville Town	X					4,000	$100,000	

Fire Station							sq. ft.		
Water Tanks (two tanks)	Kanarraville Town	X					0.38MG	$350,000	Floodplain

Name or Description of Asset **Paragonah Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Paragonah Fire Station	Paragonah Town	X					2,026 sq. ft.	$104,000	Floodplain
Paragonah Town Hall	Paragonah Town	X					673 sq. ft.	$37,000	Floodplain
Paragonah Water Tank #1	Paragonah Town	X					0.2MG	$120,000	
Paragonah Water Tank #2	Paragonah Town	X					0.06MG	$50,100	

Name or Description of Asset **Parowan Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Parowan Medical Clinic		X						$	
Parowan Medical Clinic		X						$	
Parowan Fire Station		X						$	
Parowan Police Station		X						$	
Parowan Sewer Lagoons		X			X			$	
Parowan High School		X						$	
Parowan Elementary School		X	X					$	
Parowan Municipal Airport		X		X				$	

Analysis of the Infrastructure of Iron County

A listing of the Infrastructure of Iron County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 38 below:

Table 39 Critical Infrastructure of Iron County

Name of Town **Parowan**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	12	0	9	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	89	4	47	3	45	0	0	0	0	0	0	2	0	45
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	238.48	2.36	217.78	.63	3	0	0	0	0	0	0	.66	0	3
Railways (miles)	133.91	0	130.78	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	244.66	0	237.47	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	186.85	0	178.18	0	0	.24	.012	0	0	0	0	.25	.012	.025
HAZARDS														
Flood Zones (sq miles)	53.29	.24	46.35											
Land Slides (sq miles)	145.37	.84	142.25											
Problem Soils (sq miles)	66.60	0	66.52											
Volcanic Flows (sq miles)	55.50	0	55.47											
Wildfires (sq miles)	1349.44	1.85	1340											

Name of Town Brian Head	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	12	0	9	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	89	0	47	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	238.48	2.38	217.78	0	0	.92	4	0	0	0	0	1.79	0	4
Railways (miles)	133.91	0	130.78	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	244.66	0	237.47	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	186.85	.38	178.18	0	0	.16	.008	0	0	0	0	.04	.002	.010
HAZARDS														
Flood Zones (sq miles)	53.29	0	46.35											
Land Slides (sq miles)	145.37	2.25	142.25											
Problem Soils (sq miles)	66.60	0	66.52											
Volcanic Flows (sq miles)	55.50	0	55.47											
Wildfires (sq miles)	1349.44	2.77	1340											

Name of Town Cedar City	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	12	0	9	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	89	38	47	19	245	0	0	0	0	0	0	0	0	245
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	238.48	14.60	217.78	3.78	15	0	0	.36	1.5	0	0	5.6	0	16.5
Railways (miles)	133.91	3.13	130.78	1.66	4	0	0	0	0	0	0	0	0	4
Utility Lines (miles)	244.66	7.19	237.47	2.41	.12	0	0	0	0	0	0	2.7	.135	.255
Other Utility Lines (miles)	186.85	7.10	178.18	3.44	.17	0	0	0	0	0	0	2.51	.126	.296
HAZARDS														
Flood Zones (sq miles)	53.29	4.23	46.35											
Land Slides (sq miles)	145.37	.06	142.25											
Problem Soils (sq miles)	66.60	.08	66.52											
Volcanic Flows (sq miles)	55.50	.01	55.47											
Wildfires (sq miles)	1349.44	4.21	1340											

Name of Town **Enoch**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	12	0	9	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	89	0	47	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	244.66	1.36	217.78	0	0	0	0	0	0	0	0	.11	0	0
Railways (miles)	133.91	0	130.78	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	148.27	0	237.47	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	186.85	1.19	178.18	0	0	0	0	0	0	0	0	.22	.011	.011
HAZARDS														
Flood Zones (sq miles)	53.29	0	46.35											
Land Slides (sq miles)	145.37	0	142.25											
Problem Soils (sq miles)	66.60	0	66.52											
Volcanic Flows (sq miles)	55.50	00	55.47											
Wildfires (sq miles)	1349.44	.49	1340											

Name of Town Kanarraville	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	12	0	9	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	89	0	47	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	244.66	0	217.78	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	133.91	0	130.78	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	148.27	0	237.47	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	186.85	0	178.18	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	53.29	.01	46.35											
Land Slides (sq miles)	145.37	0	142.25											
Problem Soils (sq miles)	66.60	0	66.52											
Volcanic Flows (sq miles)	55.50	00	55.47											
Wildfires (sq miles)	1349.44	.12	1340											

Name of Town **Paragonah**	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	12	0	9	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	89	0	47	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	244.66	0	217.78	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	133.91	0	130.78	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	148.27	0	237.47	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	186.85	0	178.18	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	53.29	.24	46.35											
Land Slides (sq miles)	145.37	0	142.25											
Problem Soils (sq miles)	66.60	0	66.52											
Volcanic Flows (sq miles)	55.50	.02	55.47											
Wildfires (sq miles)	1349.44	.08	1340											

Unincorporated Area of County	County Total	Towns Total	Unincorporated	FloodZone Unincorporated	Flood Zone Costs in Millions $	LandSlide Unincorporated	Land Slide Costs in Millions $	ProblemSoil Unincorporated	Problem Soil Costs in Millions $	VolcanicFlow Unincorporated	Volcanic Flow Costs in Millions $	Wildfire Unincorporated	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	12	0	9	1	0	2	0	1	0	0	0	10	0	0
# of Highway Bridges	89	0	47	2	20	0	0	2	20	0	0	24	0	40
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	244.66	0	217.78	2.58	10	5.61	22	2.68	11	.55	2	102	0	45
Railways (miles)	133.91	0	130.78	6.33	15.2	0	0	1.2	2.9	0	0	117	468	486
Utility Lines (miles)	148.27	0	237.47	3.77	.19	16	.80	3.36	.17	2.95	.15	114	5.7	7.01
Other Utility Lines (miles)	186.85	0	178.18	3.39	.17	7.32	.37	0	0	2.53	.13	60.5	3.02	3.68
HAZARDS														
Flood Zones (sq miles)	53.29	.24	46.35											
Land Slides (sq miles)	145.37	0	142.25											
Problem Soils (sq miles)	66.60	0	66.52											
Volcanic Flows (sq miles)	55.50	.02	55.47											
Wildfires (sq miles)	1349.44	9.44	1340											

Wildfire

FEMA Hazard Profile
Frequency: Likely (drought patterns are cyclical)
Severity: Negligible to moderate or high for structures in incorporated communities and Moderate to High to structures in unincorporated Iron County. Varies by location.
Duration: Containment time varies for each fire.

Assessing Vulnerability

Overall Summary of Impacts

Wildfires occur every year in the United States. Factors that influence the potential for wildfires include: type, amounts and conditions of fuel supply (vegetation); temperatures; wind conditions; precipitation patterns; humidity levels; topography and the levels of human activity on the land. Fires in areas of heavy vegetation, if not quickly detected and suppressed can quickly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property.

Most rural wildfires result from thunderstorm activity. In addition, other wildfires are started by acts of human carelessness during activities such as controlled burns of forest areas; burning of ditch banks and fields by landowners; recreational activity such as camping, hunting, and other off-road vehicle travel; and use of both legal and illegal fireworks.

The Five County Association of Governments GIS, utilizing available data, has identified residential and commercial structures at moderate or high risk from wildfire. See Table 39 for an analysis of wildfire risk in Iron County.

In Brian Head there are 129 residential units in a moderate wildfire risk area with an estimated market value of $9,330,248. This is 10.76% of the residential units in the town. There are 29 businesses in Brian Head at moderate risk from wildfire. The market value of these structures, as provided by the Iron County Assessors office is $4,879,891. This is 100% of the commercial structures in Brian Head. According to available data, there are no residential or commercial structures at high or extreme risk from wildfire in Brian Head.

In Cedar City there are approximately112 residential units in a moderate wildfire risk area with an estimated market value of $12,191,088. This is 2.21% of the residential units in the city. There are approximately 129 residential units in a high wildfire risk area with an estimated market value of $14,041,521. This is 2.55% of the residential units in the city. There are approximately 540 residential units in an extreme wildfire risk area with an estimated market value of $58,757,399. This is 10.67% of the residential units in the town. There are approximately 90 businesses in Cedar City at moderate risk from wildfire. There are approximately 2,397 persons (11.67% of the City's population) at risk from wildfire. There are approximately 21 businesses in Cedar City at high risk from wildfire. There are approximately 110 businesses in Cedar City at extreme risk from wildfire. The market value of these structures, estimated from information provided by the Iron County Assessors office is $85,915,821. This is 68.84% of the commercial structures in Cedar City.

In Enoch there is one residential unit in a moderate wildfire risk area with an estimated market value of $79,635. This is 0.08% of the residential units in the city. There are 6 residential units in a high wildfire risk area with an estimated market value of $477,810. This is 0.51% of the residential units in the city. There are 6 residential units in an extreme wildfire risk area with an estimated market value of $477,810. This is 0.51% of the residential units in the city. There are approximately 47 persons (1.35% of the City's population) at risk from wildfire.

In Kanarraville there are 5 residential units in a high wildfire risk area with an estimated market value of $328,948. This is 3.20% of the residential units in the town. There are approximately 13 persons (4.18% of the town's population) at risk from wildfire.

In Paragonah there are 43 residential units in a moderate wildfire risk area with an estimated market value of $2,809,593. This is 19.19% of the residential units in the town. There are approximately 129 persons (27.40% of the town's population) at risk from wildfire.

In Parowan there are 17 residential units in a moderate wildfire risk area with an estimated market value of $1,227,024. This is 1.40% of the residential units in the city. There are approximately 48 persons (1.87% of the City's population) at risk from wildfire. There are 2 businesses in Parowan City at moderate risk from wildfire. The market value of those structures, estimated from information provided by the Iron County Assessors office is $216,063. This is 2.35% of the commercial structures in Parowan City.

In unincorporated Iron County there are 142 residential structures at moderate risk from wildfire. Based upon figures provided by the Iron County Assessors Office, the market value of those structures is estimated to be $9,978,908. There are 123 residential structures at high risk from wildfire. Based upon figures provided by the Iron County Assessors Office, the market value of those structures is estimated to be $8,643,702. There are 6 residential structures at extreme risk from wildfire. Based upon figures provided by the Iron County Assessors Office, the market value of those structures is estimated to be $421,644. Based upon the average household size of 3.11 persons, in Iron County, from the 2000 U.S. Census, there are approximately 843 persons at risk from wildfire. This is 13.33% of the 6,321 population of unincorporated Iron County. There are 13 commercial structures in unincorporated Iron County identified to be in a moderate wildfire risk area. The estimated value of those structures is $4,345,484. There are 7 commercial structures in unincorporated Iron County identified to be in a high wildfire risk area. The estimated value of those structures is $2,339,876. There are 7 commercial structures in unincorporated Iron County identified to be in an extreme wildfire risk area. The estimated value of those structures is $2,339,876.

Number of People/Buildings Impacted by Wildfire

Table 39 Analysis of Wildfire Risk in Iron County

Brian Head – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,198	129	10.76%	$86,648,357	$9,330,248	10.76%	118	277*	234.74%
Commercial	29	29	100%	$4,876,891	$4,876,891	100%	N/A	N/A	N/A
Total	1,227	158	12.87%	$91,525,248	$14,207,139	15.52%	118	277	234.74%

* The number of rental units in a wildfire risk area is far greater than the number of permanent residences. The number of persons at risk is calculated as a percentage of the town's population, regardless of ownership/renter status.

Cedar City – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	5,057	781	15.44%	$550,453,426	$84,990,008	15.44%	20,527	2,397	11.67%
Commercial	321	221	68.84%	$124,805,087	$85,915,821	68.84%	N/A	N/A	N/A
Total	5,378	1,002	18.63%	$675,258,513	$170,905,847	25.30%	20,527	2,397	11.67%

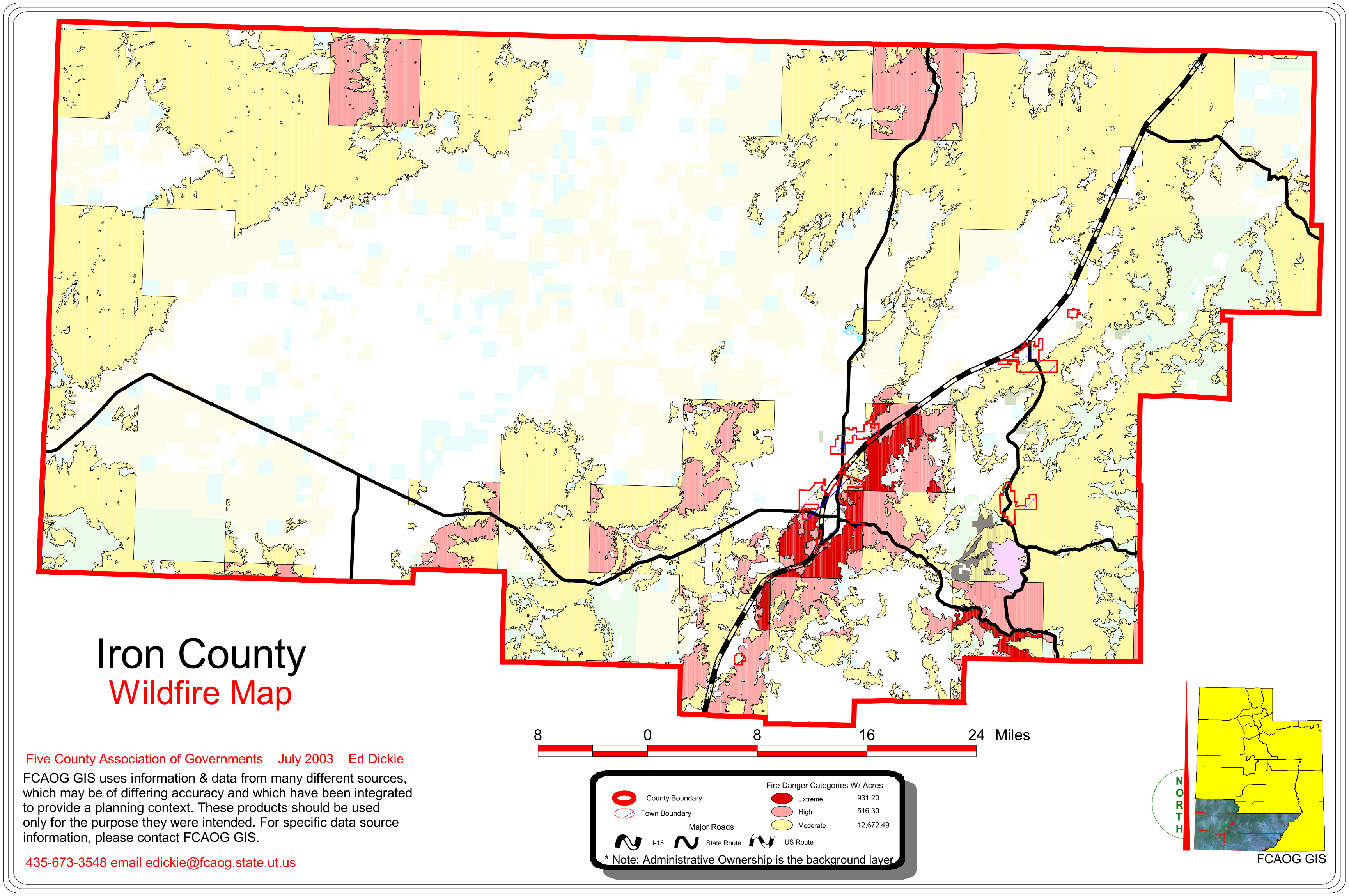
Enoch - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,162	13	1.11%	$92,536,283	$1,027,152	1.11%	3,467	47	1.35%
Commercial	7	0	28.57%	$765,812	$0	0%	N/A	N/A	N/A
Total	1,169	13	1.11%	$93,302,095	$1,027,152	1.10%	3,467	47	1.35%

Kanarraville - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	156	5	3.20%	$10,279,649	$328,948	3.20%	311	13	4.18%
Commercial	3	0	0%	$90,361	$0	0%	N/A	N/A	N/A
Total	159	5	3.14%	$10,370,010	$328,948	3.17%	311	13	4.18%

Paragonah - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	224	43	19.19%	$14,640,927	$2,809,593	19.19%	470	129	27.4%
Commercial	1	0	0%	$32,807	$0	0%	N/A	N/A	N/A
Total	225	43	19.11%	$14,673,734	$2,809,593	19.14%	470	129	27.4%

Parowan - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,208	17	1.40%	$87,644,593	$1,227,024	1.40%	2,565	48	1.87%
Commercial	85	2	2.35%	$9,194,192	$216,063	2.35%	N/A	N/A	N/A
Total	1,293	19	1.46%	$96,838,785	$1,443,087	1.49%	2,565	48	1.87%

Unincorporated Iron County - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,275	271	8.27%	$230,148,114	$19,033,249	8.27%	6,321	843	13.33%
Commercial	388	27	6.95%	$129,696,289	$9,013,892	6.95%	N/A	N/A	N/A
Total	3,663	298	8.13%	$368,253,819	$28,047,141	7.61%	6,321	843	13.33%



Iron County
Wildfire Map
Five County Association of Governments July 2003 Ed Dickie
FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.
435-673-3548 email edickie@fcaog.state.ut.us
8 0 8 16 24 Miles
County Boundary
Town Boundary
Major Roads
I-15
State Route
US Route
Fire Danger Categories W/ Acres
Extreme 931.20
High 516.30
Moderate 12,672.49
* Note: Administrative Ownership is the background layer
NORTH
FCAOG GIS

Landslides

FEMA Hazard Profile
Frequency: Likely
Severity: Negligible to severe
Duration: range from very short duration slope failures to long-term ground movement. Duration varies by location.

Assessing Vulnerability

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available data, has identified areas at risk from landslide residential and commercial structures at risk from landslide. See Table 40 for an analysis of landslide risk in Iron County.

According to the available data, there are 64 residential structures at risk from landslide in unincorporated Iron County. This is 1.95% of the residential units in unincorporated Iron County. The market value of those structures is estimated to be $4,497,550.

There are 67 residential structures at risk from landslide in Brian Head. This is 5.59% of the residential units in Brian Head. The market value of those structures is estimated to be $4,845,943.

There are 22 residential structures at risk from landslide in Cedar City. This is 0.43% of the residential units in Cedar City. The market value of those structures is estimated to be $2,394,695.

Available data indicates that there appears to be no commercial structures at risk from landslide in Iron County.

Number of People/Buildings Impacted by Landslides

Table 40 Analysis of Landslide Risk in Iron County

Brian Head – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,198	67	5.59 %	$86,648,357	$4,845,943	5.59%	118	144*	122%
Commercial	29	0	0%	$4,876,891	$0	0%	N/A	N/A	N/A
Total	1,227	67	5.46 %	$91,525,248	$4,845,943	5.29%	118	144	122%

* The number of rental units in a landslide risk area is greater than the number of permanent residences. The number of persons at risk is calculated as a percentage of the town's population, regardless of ownership/renter status.

Cedar City – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	5,057	22	0.43%	$550,453,426	$2,394,695	0.43%	20,527	67	0.33%
Commercial	321	0	0%	$124,805,087	$0	0%	N/A	N/A	N/A
Total	5,378	22	0.41%	$ 675,258,513	$2,394,695	0.35%	20,527	67	0.33%

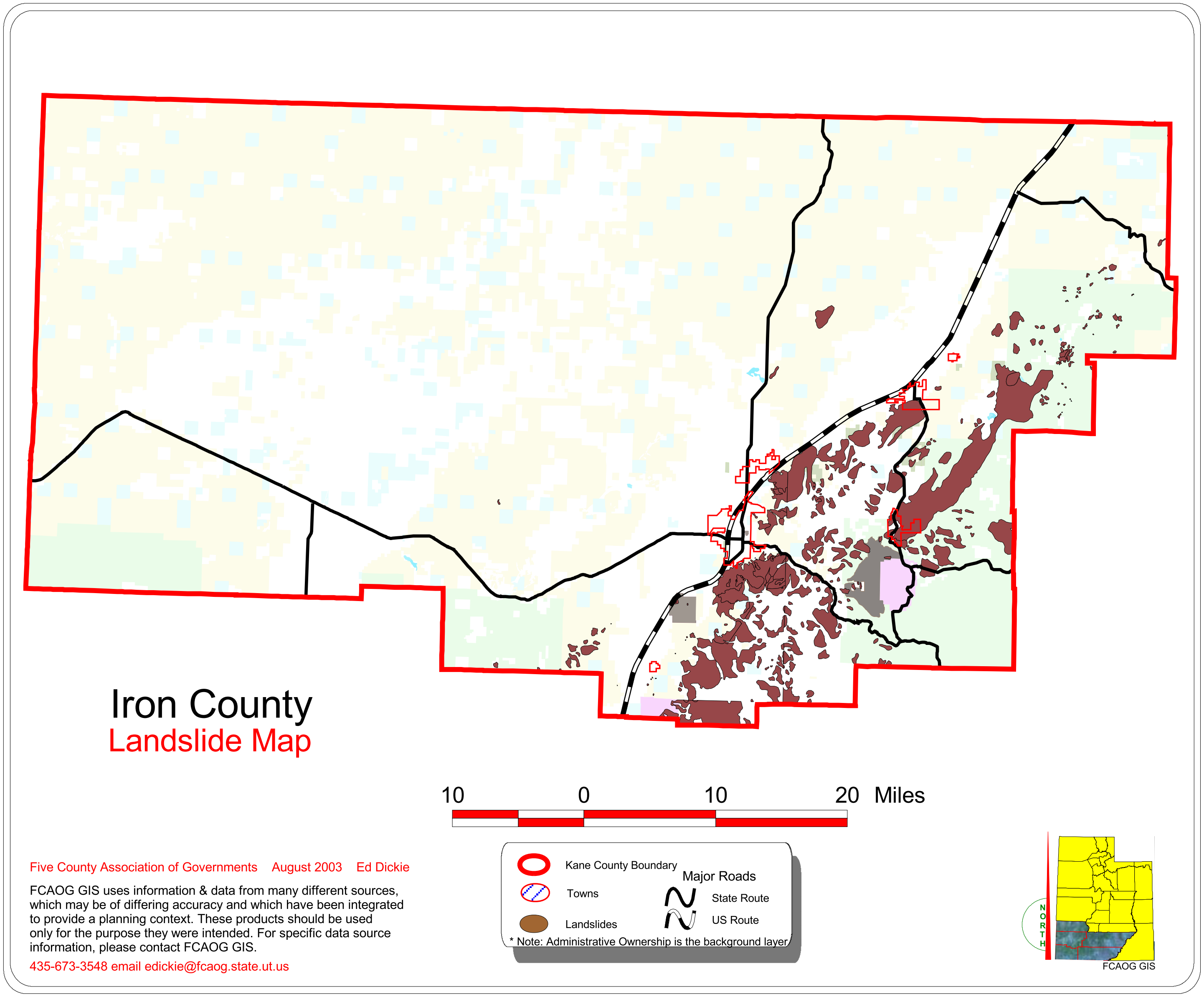
Enoch - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,162	0	0%	$92,536,283	$0	0%	3,467	0	0%
Commercial	7	0	0%	$765,812	$0	0%	N/A	N/A	N/A
Total	1,169	0	0%	$ 93,302,095	$0	0%	3,467	0	0%

Kanarraville - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	156	0	0%	$10,279,649	$0	0%	311	0	0%
Commercial	3	0	0%	$90,361	$0	0%	N/A	N/A	N/A
Total	159	0	0%	$10,370,010	$0	0%	311	0	0%

Paragonah - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	224	0	0%	$14,640,927	$0	0%	470	0	0%
Commercial	1	0	0%	$32,807	$0	0%	N/A	N/A	N/A
Total	225	0	0%	$14,673,734	$0	0%	470	0	0%

Parowan - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,208	26	2.15%	$87,644,593	$1,886,390	2.15%	2,565	74	2.88%
Commercial	85	0	0%	$9,194,192	$0	0%	N/A	N/A	N/A
Total	1,293	26	2.01%	$96,838,785	$1,886,390	1.95%	2,565	74	2.88%

Unincorporated Iron County - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,275	64	1.95%	$230,148,114	$4,497,550	1.95%	6,321	199	3.15%
Commercial	388	0	0%	$129,696,289	$0	0%	N/A	N/A	N/A
Total	3,663	64	1.74%	$368,253,819	$4,497,550	1.22%	6,321	199	3.15%


Iron County
Landslide Map
10 0 10 20 Miles
Five County Association of Governments August 2003 Ed Dickie
FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.
435-673-3548 email edickie@fcaog.state.ut.us
Kane County Boundary
Towns
Landslides
Major Roads
State Route
US Route
* Note: Administrative Ownership is the background layer
NORTH
FCAOG GIS

Earthquake

Assessing Vulnerability and Overall Summary of Impacts

HAZUS MH Earthquake Vulnerability Assessment

See Table 41 below for an estimate of earthquake casualties.

Table 41 Earthquake Casualties Risk in Iron County

Casualties	Nighttime –Minor	344
	Nighttime –Major	9
	Nighttime -Fatalities	17
	Daytime –Minor	302
	Daytime –Major	11
	Daytime- Fatalities	21
	Commute –Minor	321
	Commute –Major	11
	Commute-Fatalities	20

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 42 below lists the number buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 42 Building Damage from Moderate to Complete by Count

Category	Number of Structures	Total Cost in millions of dollars **
Residential	998	324.36
Commercial	84	83.10
Industrial	5	13.02
Totals	5,803*	436.67**

*****Includes all building categories with moderate to complete damage
** Structural, non-structural, content, inventory

Table 43 Damage to Critical Facilities from Moderate to Complete

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	1	0	0	1
Schools	14	3	0	0
EOCs	0	0	0	0
Police Stations	3	0	0	0
Fire Stations	4	2	0	0

Debris Removal –Table 44 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 44 –Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	289
Loads (25 tons per load)	11,560

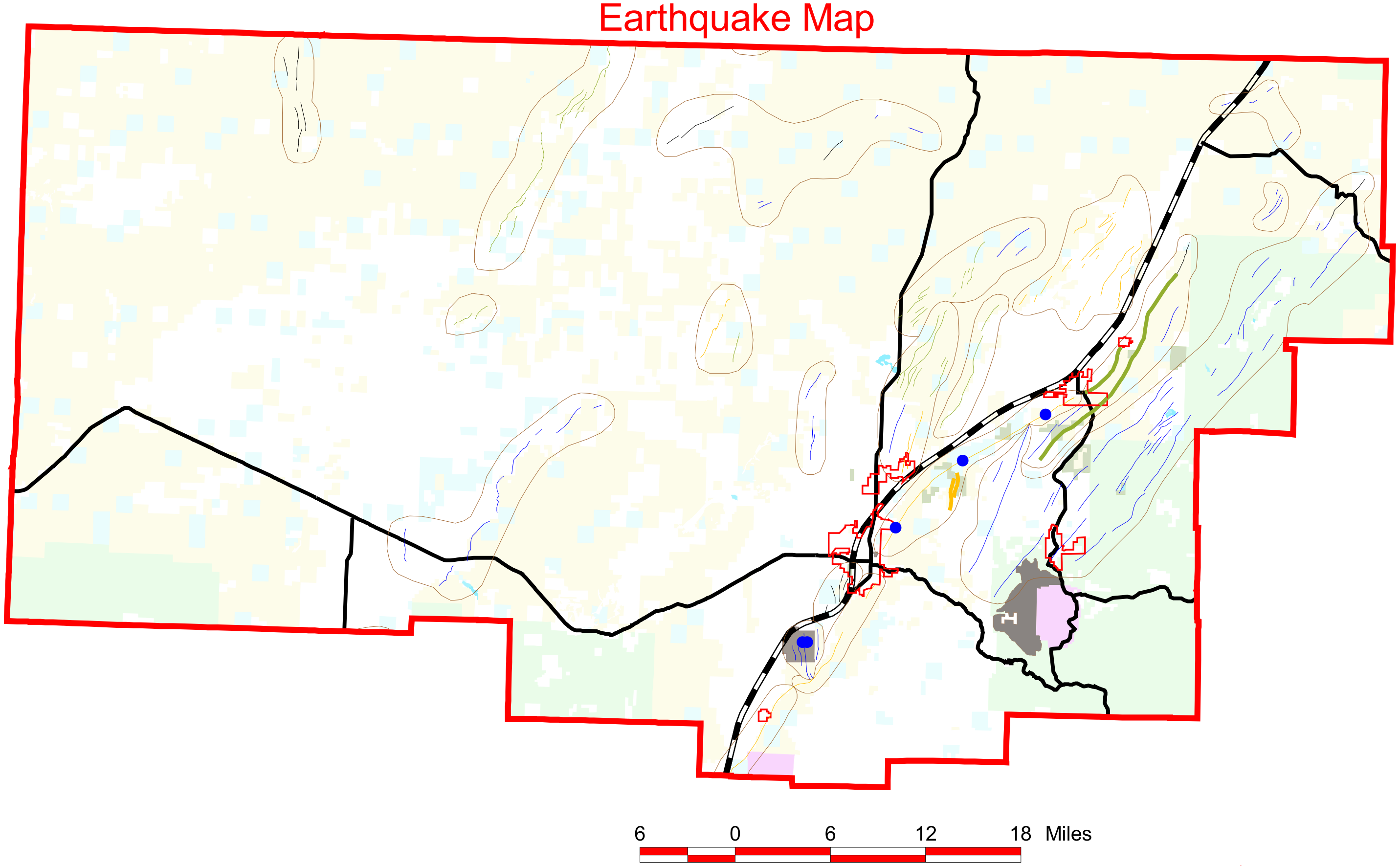
Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 45 below provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

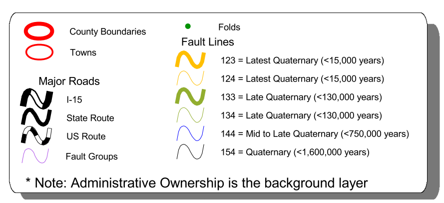
Table 45 –Fire Following Event, Population Exposed, and Building Stock Exposed

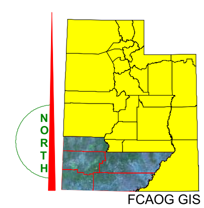
Ignitions	3
People Displaced	3
Value Exposed (thousand $)	126

These numbers were derived from a HAZUS MH run based on a probabilistic 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete HAZUS MH run performed by the Utah Division of Emergency Services and Homeland Security is available at the Five County Association of Governments.

Iron County
Earthquake Map







Five County Association of Governments September 2003 Ed Dickie

435-673-3548 email edickie@fcaog.state.ut.us

Flood

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe depending on location.
Duration: range from very short duration flash flooding to longer-term inundation. Duration varies by location.

Assessing Vulnerability: Identifying Assets and Estimating Losses

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available floodplain data, has identified residential and commercial structures located within the 100-year floodplain (A Zone). See Table 46 for an analysis of landslide risk in Iron County.

Based upon review of available data, in Cedar City there are 596 residential structures located in a floodplain (A Zone). These structures located in floodplains account for 11.78% of the residential structures in Cedar City. Based upon an estimated average market value of residential structures in the city, the market value of these structures is approximately $64,874,479. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.07 persons per household in Cedar City, there are approximately 1,830 persons at risk from floodplains. There are approximately 66 businesses located in a floodplain. The estimated market value of those structures is $25,660,859.

Based upon review of available data, in the town of Paragonah there are 147 residential structures located in a floodplain (A Zone). These structures located in floodplains account for 65.62% of the residential structures in Paragonah. Based upon an estimated average market value of residential structures in the town, the market value of these structures is approximately $9,608,108. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.01 persons per household in Paragonah, there are approximately 442 persons at risk from floodplains. There is one business located in a floodplain. The estimated market value of that structure is $32,807.

Based upon review of available data, in Parowan City there are 33 residential structures located in a floodplain (A Zone). These structures located in floodplains account for 2.73% of the residential structures in Parowan. Based upon an estimated average market value of residential structures in the city, the market value of these structures is approximately $2,394,264. Based upon an average household size (U.S. Census Bureau, Census 2000) of 2.84 persons per household in Parowan, there are approximately 94 persons at risk from floodplains. There are two businesses located in a floodplain. The estimated market value of those structures is $216,333.

Based upon review of available data, in Unincorporated Iron County there are 102 residential structures located in a floodplain (A Zone). These structures located in floodplains account for 3.11% of the residential structures in unincorporated Iron County. Based upon an estimated average market value of residential structures in the unincorporated portion of Iron County, the market value of these structures is approximately $7,167,971. Based upon an average household size (U.S. Census Bureau, Census 2000) of

3.11 per household in Iron County, there are approximately 317 persons at risk from floodplains.

Number of People and Buildings/Structures Impacted by floodplains

Table 46 Analysis of Flood Risk in Iron County

Brian Head – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,198	0	0%	$86,648,357	$0	0%	118	0*	0%
Commercial	29	0	0%	$4,876,891	$0	0%	N/A	N/A	N/A
Total	1,227	0	0%	$91,525,248	$0	0%	118	0	0%

Cedar City – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	5,057	596	11.78 %	$550,453,426	$64,874,479	11.78%	20,527	1,830	8.91%
Commercial	321	66	20.56 %	$124,805,087	$25,660,859	20.56%	N/A	N/A	N/A
Total	5,378	662	12.30 %	$ 675,258,513	$90,535,338	13.40%	20,527	1,830	8.91%

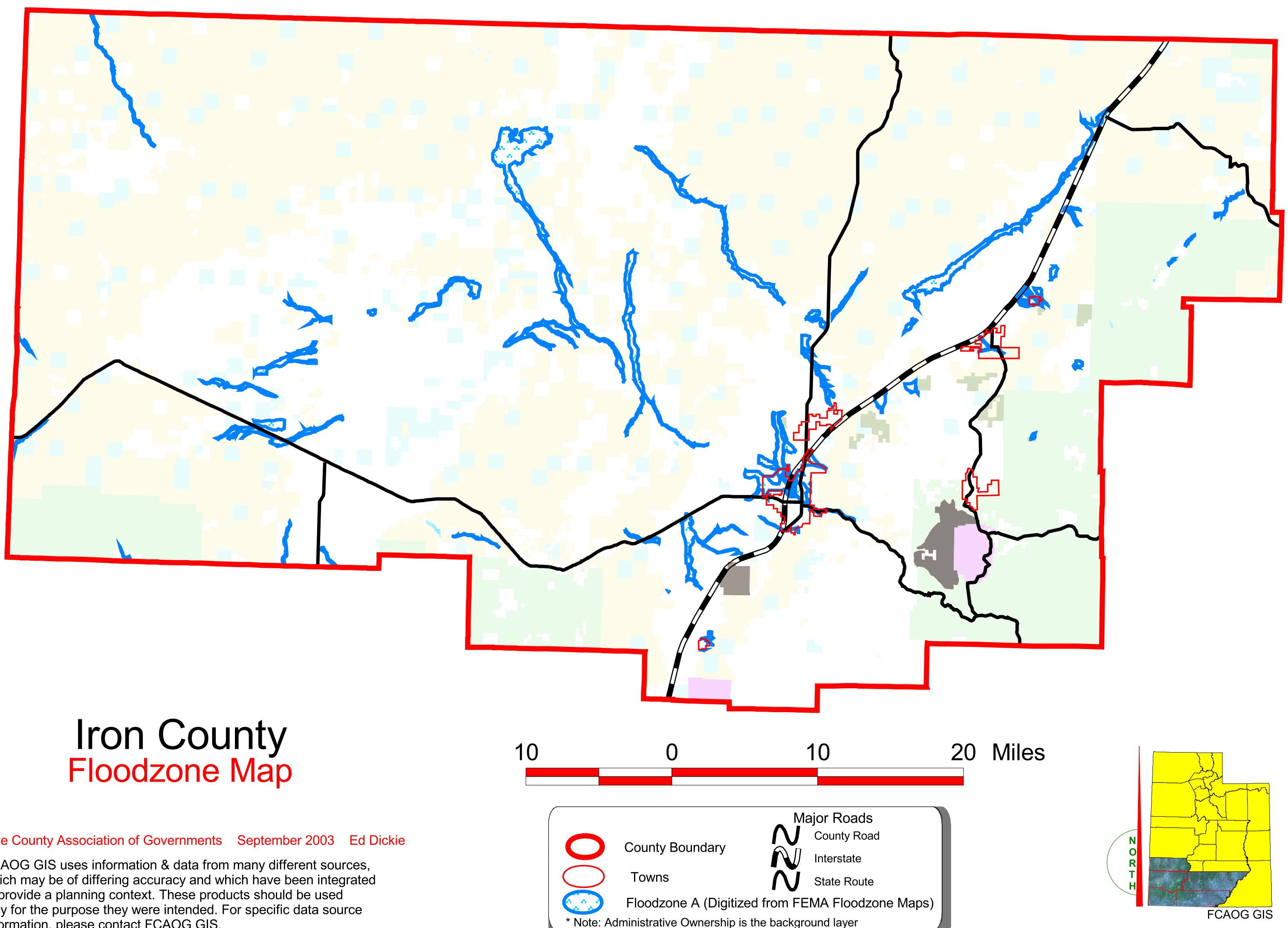
Enoch - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,162	0	0%	$92,536,283	$0	0%	3,467	0	0%
Commercial	7	0	0%	$765,812	$0	0%	N/A	N/A	N/A
Total	1,169	0	0%	$ 93,302,095	$0	0%	3,467	0	0%

Kanarraville - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	156	0	0%	$10,279,649	$0	0%	311	0	0%
Commercial	3	0	0%	$90,361	$0	0%	N/A	N/A	N/A
Total	159	0	0%	$10,370,010	$0	0%	311	0	0%

Paragonah - Floodplain									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	224	147	65.62%	$14,640,927	$9,608,108	65.52%	470	442	94.04%
Commercial	1	1	100%	$32,807	$32,807	100%	N/A	N/A	N/A
Total	225	148	65.77%	$14,673,734	$9,640,915	65.70%	470	442	94.04%

Parowan - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,208	33	2.73%	$87,644,593	$2,394,264	3.06%	2,565	94	3.66%
Commercial	85	2	2.35%	$9,194,192	$216,333	2.35%	N/A	N/A	N/A
Total	1,293	35	2.70%	$96,838,785	$2,610,597	2.69%	2,565	94	3.66%

Unincorporated Iron County - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,275	102	3.11%	$230,148,114	$7,167,971	3.11%	6,321	317	5.01%
Commercial	388	0	0%	$129,696,289	$0	0%	N/A	N/A	N/A
Total	3,663	102	2.78%	$368,253,819	$7,167,971	1.94%	6,321	317	5.01%



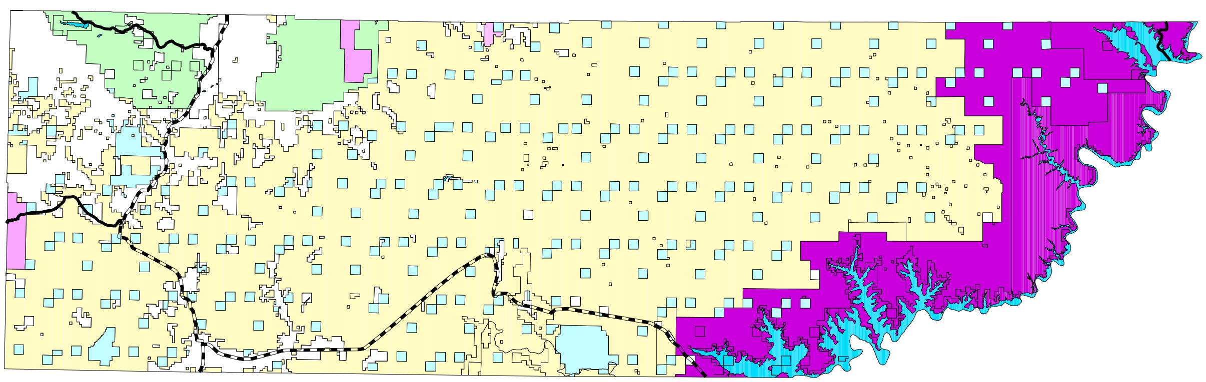
Iron County
Floodzone Map

Five County Association of Governments September 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Kane County



History

Kane County encompasses an area of 3,904 square miles. The county seat of Kane County is Kanab. The county is named after Thomas L. Kane, an influential supporter of the Church of Jesus Christ of Latter Day Saints. The other cities/towns in Kane County include Alton, Big Water, Glendale and Orderville. The economy is principally driven by tourism and services. Several of the points of interest in Kane County include Lake Powell, Coral Pink Sand Dunes, the Old Paria movie sets, Navajo Lake, and Hole-in-the Rock, accessible from near Escalante in Garfield County.

The high desert landscape of Kane County is located within the Colorado Plateau geographical province. Lake Powell, created by Glen Canyon Dam, on the Colorado River forms the county's eastern border. The northwest corner of the county is forested.

Inhabiting the County during prehistoric times were Indian dwellers that were part of the Anasazi Culture. Archaeologists have recorded hundreds of sites on Fifty Mile Mountain within the Glen Canyon National Recreation Area, but few have been excavated because of their remoteness. Historic Indian groups are primarily Southern Paiute.

Several towns, including Kanab, were settled in the mid-1860s, but later abandoned. Kanab was resettled in 1870 by Levi Stewart and others. This was done at the request of LDS Church President Brigham Young. In March 1874, Brigham Young encouraged the formation of a United Order at Orderville. United Orders were organized in many Utah communities, including Kanab, but the Orderville experiment in communal living was more successful and survived than any of the others. Orderville thus was unique among Utah towns. By the 1880s, however, the United Order of Orderville was dissolved.

During the nineteenth and early twentieth centuries a majority of the county's residents were either farmers or raised livestock. In 1922, when the movie Deadwood Coach with actor Tom Mix was filmed in Kane County, the Parry brothers of Kanab led in the development of lodging, food, and other services for film crews. By the 1930s Kanab was became known as "Little Hollywood" because so many films were shot there.

The 1920s and 1930s also saw Kanab become a tourist center for visitors to Bryce Canyon, Zion, and Grand Canyon national parks. During the construction of Glen Canyon Dam near Page, Arizona, which began in 1956, Kanab's population doubled and the economy boomed. The creation of Lake Powell, one of Utah's major recreational sites, brought new service industries connected with boating and fishing to the area, especially the Bullfrog Basin marina in the extreme northeast corner of the county.

Development Trends

Population

After suffering from out-migration during the 1960s, Kane County has typically experienced faster than average population expansion. However, in the 1990s, Kane County’s growth slowed. Between 1990 and 2000, Kane County’s population grew by 17 percent—placing it in the bottom-third of Utah’s counties. During the 1990s, population grew fastest outside the major townships. In fact, Kanab showed the slowest population expansion of all. Even though Kanab’s growth rate appeared low between 1990 and 2000, it still showed the largest net increase in population because of its size. With almost 3,600 residents, Kanab is by far the largest city in Kane County. The next largest Town, Orderville, shows only about 600 residents. With only 1.6 persons per square mile, Kane County is one of the least densely populated counties in the state. In comparison to the United States, Kane County's population is much more youth-heavy and at the same time, has a higher share of retirement age people. When compared to the Utah age distribution, Kane County appears much older. The county shows a heavy concentration of residents over the age of 45. The percentage of Kane County's population over the age of 65 registers substantially higher than that of the state or the nation. Both the state of Utah and Kane County have a high share of young people and children compared to the national average. With a higher than average share of "seniors" and young people, Kane County's share of "working-age" population (18 to 65 years old) is much smaller than both the Utah and U.S. figures. Kane County's population is less diverse than either Utah's or the nation's. In 2000, only 5 percent of the population was Hispanic or Nonwhite. In the decade of the 1990s, the most eye-catching change in the county's race/ethnic distribution was the substantial growth in Kane County's Hispanic population. Between 1990 and 2000, Kane County's average household size decreased from 2.98 persons to 2.67 persons. Kane County families are more likely to have a married couple at their head than the state or national averages. Kane County also showed a noticeably smaller percentage of female-headed families with children under 18 years of age. Kane County's share of high school graduates increased between 1990 and 2000 and registers significantly higher than the national average. The share of individuals with a college degree almost doubled in Kane County between 1990 and 2000.

Labor Market Indicators

Lately, most of Kane County's indicators have taken an economic roller coaster ride. However, their clues suggest a less than robust business sector. Job growth (or lack thereof) has shown the most volatility in 2003. However, a huge job dip occurred in early 2002 at more than 6 percent. Then the pendulum took a swing back up to almost 6 percent growth in July 2002. But, by the end of third quarter 2002, the county barely eked out positive growth.

Data for September 2002, shows year over employment expansion of only 0.2 percent. That represents a net gain of less than 10 positions. Many more industries lost jobs than gained them. Retail trade and accommodations/food services took the largest employment hits. Local government (which includes the school district) also showed a significant employment decline.

On the positive side, construction and recreation added enough jobs to offset the declines in other industries. Moreover, the announcement that a major bank will be locating a customer service center in the county should prop up employment numbers.

In comparison to the vacillations in job growth, unemployment rates in the county seem almost stable. True, the rates have had their ups and downs, but they've kept to a fairly narrow corridor between 3 and 4 percent. The February 2003 rate measured only 3.9 percent noticeably below the state and national averages. So, while the job market has gone through some wild fluctuations, most workers have been able to find employment.

Construction Permits

Construction permitting also has varied widely from quarter to quarter. However, the Utah Department of Workforce Services expects that behavior from this particular industry. The final quarter of 2002 ended with an 87 percent year to year increase. However, this last minute construction rush wasn't enough to keep the whole year in the black. Annual 2002 figures show a slight 8 percent decline in authorized construction values.

A decrease in the number of authorized new homes proved the main culprit behind construction's slight 2002 drop. New dwelling unit permits dropped 18 percent in comparison to 2001 and the value of those permits slipped by about 12 percent. But, while Kane County residents might not be building new homes, they are remodeling and making additions to their existing houses. Almost $1.3 million in home renovations was approved a 75 percent increase over 2001.

Nonresidential construction surged ahead in 2002. Values rose almost 20 percent. Larger projects included one public building and one retail store.

Taxable Sales
Kane County continued to experience difficulty in the sales arena. In the past two years, gross taxable sales have increased in only two quarters. Third quarter 2002 didn't depart from that path. Sales dropped 6 percent in comparison to an already poor third quarter 2001. Sales in retail trade were particularly sluggish but a decline in services and wholesale trade sales pushed the overall sales rate into negative territory.

Land Use
Major emphasis in developing the original Kane County Master Plan was necessarily placed on planning facilities to accommodate the growth in numbers of people visiting part of the county where comparatively few people had traveled until the Glen Canyon Dam was under construction between 1956 and 1964.

The county has a wealth of the mineral resources. The oil, gas, coal and uranium resources are manifestly documented. Of lesser impact are copper, magnesium, lead, gold, and silver all of which are deposited throughout the entirety of the county. Development of these resources is controlled by the land use restrictions of the land owners, in most cases the United States government.

The cattle industry has been a mainstay of the economy of Kane County. Through federal mismanagement of the land resources and the general economy, the cattle industry has become less impactual. For this segment of the economy to survive it must be revitalized to meet growing consumer needs. It must be allowed to prosper to enhance the depressed economy of Kane County.

The 4,373 square miles, or approximately 3,798,720 acres of land in Kane County makes it larger than the states of Rhode Island, Delaware, and the District of Columbia combined, and almost as large as the entire state of Connecticut. The sheer size of this area requires effective planning and administration if the future land use developments are to be in the best interest of the general public as well as private individuals.

Of this entire area, only 218 square miles are private deeded lands. The remainder is controlled by the State of Utah (487 square miles) and the Federal Government (3,718 square miles) through the agency of the Bureau of Land Management, the U.S. Forest Service, and the National Park Service.

Kane County is a land rich in natural beauty, natural resources, and great potential. It is also a land that has been "found" by the tourists as well as by the geologists, miners, and developers. The role of the people in Kane County is in preserving those areas that are important while working to develop those resources that can be in a responsible manner.

Development Activities

The following activities have occurred in Kane County during the past year. While this is not an all-inclusive listing, is indicative of the development trends occurring in Kane County.

The Utah Permanent Community Impact Board awarded a $105,000 loan to Glendale for the reconstruction 1.1 miles of streets. Salt Lake Tribune, 4/7/03

The Lake Powell ferry service between Bullfrog Marina and Hall's Crossing resumed. The ferry service was suspended March 3 to allow docks to be relocated to Hobie Cat Beach at Bullfrog. Salt Lake Tribune, 3/30/03

Salt Lake based Zion Bank announced it will create a second customer service center in Kanab. Designed to handle operations if the bank's main facility in West Valley city were knocked out, the Kanab center will add 40 new jobs this year, with a total of 70 jobs expected within three years. The service center jobs will pay between $9 and $10 an hour. Deseret News, 3/22/03

Kanab is considering selling its city owned power system to GarKane, the rural electrical cooperative in south central Utah. If the Kanab City Electric Distribution System sells, the city would seek a franchise arrangement. The city is also considering opening the sale to other potential buyers. Salt Lake Tribune, 3/18/03

The Utah School and Institutional Trust Lands Administration received a donation of 400 acre feet of water rights in Kane County from AMCA Coal Leasing Inc., a subsidiary of ANDALEX Resources, Inc. no longer needs the water since the demise of its plans for coal mining on the Kaparowits Plateau, which became part of the Grand Staircase Escalante Monument in 1996. Salt Lake Tribune, 2/26/03

Construction began on the 190 seat Crescent Moon Theater in Kanab. The theater will be home to a western music and variety show six nights a week during the May-October tourist season. Salt Lake Tribune, 2/2/03

The Board of Business and Economic Development approved Industrial Assistance Fund incentives to a financial services company that may create 70 new jobs in Kane County. The name of the business was not disclosed, but the financial company is considering plans to open a customer service center in Kanab. Deseret News, 1/18/03

The Kanab Fire Department received a $58,000 grant from the Federal Emergency Management Agency for fire operations and firefighter safety programs. Salt Lake Tribune, 10/10/02

Utah ranchers, hit hard by drought, were scheduled to receive millions of dollars in immediate federal aid. The U.S. Department of Agriculture announced it would release $752 million in cash to relieve drought stricken livestock in 37 states. Utah is one of seven states that has declared a statewide drought disaster, and therefore, qualified for a large share of the money. Salt Lake Tribune, 09/20/02

Big Water received $250,000 in grants and loans from the Community Impact Board to pave seven miles of streets. Salt Lake Tribune, 8/8/02

Plans are under way in Glendale for a second co op store along U.S. 89 that will display wares of local artists and craftmakers. The Long Valley Co op, through the Utah Heritage Highway 90 alliance, received a $15,000 grant from the U.S. Forest Service to open the Apple Valley facility. Salt Lake Tribune, 7/20/02

The Kanab City Library has received an $11,010 grant from the Bill and Melinda Gates Foundation. The library must use these funds to expand public access to computers and the internet. Salt Lake Tribune, 6/27/02

Critical Facilities of Kane County

A listing of the Critical Facilities of Kane County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 47:

Table 47 Critical Facilities of Kane County

Name or Description of Asset **Alton Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Alton Fire Station	Claren Heaton	X						$	
Alton Town Hall/Community Center	Claren Heaton	X						$	
Water Tank	Claren Heaton	X						$	
Water Tank	Claren Heaton	X						$	
Water Tank	Claren Heaton	X						$	

Name or Description of Asset **Big Water Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Big Water Fire Station	Big Water	X					Data Unavail.	$unknown	
Big Water School		X	X				30,000 sq. ft.	$1,600,000	
Big Water Town Hall/Community Center		X					Data Unavail.	$unknown	
Water Tank		X					Data Unavail.	$	
Microwave Phone/ITS Site		X					Data Unavail.	$	

Name or Description of Asset **Glendale Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Glendale Town Hall/Community Center		X					data unavail.	$unknown	Floodplain
Glendale Fire Station		X					data unavail.	$unknown	Floodplain
Water Tank		X					data unavail.	$unknown	
Water Tank		X					data unavail.	$unknown	
Water Tank		X					data unavail.	$unknown	

Name or Description of Asset Kane County	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Kane County Hospital	Kanab City	X					42,780 sq. ft.	$6,000,000	
Kanab Fire Station	Kanab City	X					6,150 sq. ft.	$600,000	
Kanab (Ranchos) Fire Station	Kanab City	X					1,820 sq. ft.	$110,000	
Kanab Police Station	Kanab City	X					1,500 sq. ft.	$95,000	
Kanab Elementary School	Kane County School District	X	X				60,000 sq. ft	$4,800,000	
Kanab Intermediate School	Kane County School District	X					42,000 sq. ft.	$4,500,000	
Kanab High School	Kane County School District	X					80,000 sq. ft.	$9,000,000	
Kanab Community Center	Kanab City	X					4,200 sq. ft.	$300,000	
Kanab Airport (value of buildings only)	Kanab City	X		X			10,888 sq. ft. total (3 buildings)	$250,000	
Kanab Sewer Lagoons	Kanab City	X			X		100 acres	$value unavailable	
Water Tank #1	Kanab City	X					1.5MG	$1,500,000	
Water Tank #2	Kanab City	X					1.5MG	$1,500,000	
Water Tank #3	Kanab City	X					1.0MG	$1,000,000	
Water Tank #4	Kanab City	X					1.0MG	$1,000,000	

Name or Description of Asset **Orderville Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Orderville Town Hall	FCAOG	X					not avail.	$unknown	
Orderville Fire Station	FCAOG	X					not avail.	$unknown	
Valley Elementary School	Kane County School District	X	X				not avail.	$unknown	
North Water Tank	FCAOG	X					not avail.	$unknown	Problem Soils
East Water Tank	FCAOG	X					not avail.	$unknown	

Analysis of Infrastructure in Kane County

A listing of the Infrastructure of Garfield County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 48 below

Name of Town **Kanab**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	22	1	17	1	5	0	0	0	0	0	0	0	0	5
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	149.59	5.60	128.20	.82	3.28	0	0	0	0	0	0	0	0	3.28
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	46.32	0	46.19	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	131.21	0	127.84	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	155.65	.46	153.34											
Land Slides (sq miles)	224.12	.02	223.85											
Problem Soils (sq miles)	445.65	0	443.09											
Volcanic Flows (sq miles)	32.83	0	32.68											
Wildfires (sq miles)	1013.31	.60	1000											

Name of Town **Alton**	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	0	0	0	0	0	0	0	0	0	0		0	0	0
# of Highway Bridges	22	0	17	0	0	0	0	0	0	0	0	0	0	0
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	149.59	0	128.20	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	46.32	0	46.19	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	131.21	0	127.84	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	155.65	0	153.34											
Land Slides (sq miles)	224.12	0	223.85											
Problem Soils (sq miles)	445.65	0	443.09											
Volcanic Flows (sq miles)	32.83	0	32.68											
Wildfires (sq miles)	1013.31	.01	1000											

Name of Town Big Water	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	22	0	17	0	0	0	0	0	0	0	0	0	0	0
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	149.59	3.9	128.20	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	46.32	.13	46.19	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	131.21	0	127.84	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	155.65	.35	153.34											
Land Slides (sq miles)	224.12	0	223.85											
Problem Soils (sq miles)	445.65	.001	443.09											
Volcanic Flows (sq miles)	32.83	00	32.68											
Wildfires (sq miles)	1013.31	13.31	1000											

Name of Town **Glendale**	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
# of Highway Bridges	22	2	17	1	5	0	0	0	0	0	0	1	5	10
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	149.59	7.49	128.20	1.51	6	0	0	0	0	0	0	4.79	0	6
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	46.32	0	46.19	.92	.046	0	0	0	0	0	0	0	0	.046
Other Utility Lines (miles)	131.21	3.37	127.84	0	0	0	0	0	0	0	0	2.01	.100	.100
HAZARDS														
Flood Zones (sq miles)	155.65	.48	153.34											
Land Slides (sq miles)	224.12	.18	223.85											
Problem Soils (sq miles)	445.65	0	443.09											
Volcanic Flows (sq miles)	32.83	.15	32.68											
Wildfires (sq miles)	1013.31	5.82	1000											

Name of Town **Orderville**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	22	4	17	4	20		0	1	5	0	0	3	0	25
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	149.59	7.49	128.20	2.27	9	0	0	2.26	9	0	0	4.03	0	18
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	46.32	0	46.19	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	131.21	0	127.84	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	155.65	1.02	153.34											
Land Slides (sq miles)	224.12	.08	223.85											
Problem Soils (sq miles)	445.65	2.55	443.09											
Volcanic Flows (sq miles)	32.83	00	32.68											
Wildfires (sq miles)	1013.31	6.76	1000											

Unincorporated Area of County	County Total	Towns Total	Unincorporated	Flood Zone Unincorporated	Flood Zone Costs in Millions $	Land Slide Unincorporated	Land Slide Costs in Millions $	Problem Soil Unincorporated	Problem Soil Costs in Millions $	Volcanic Flow Unincorporated	Volcanic Flow Costs in Millions $	Wildfire Unincorporated	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	0	0	0	0	0	0	0	0	0	0	0	3	0	0
# of Highway Bridges	22	4	17	4	20	0	0	1	5	0	0	6	0	25
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	
Major Roads (miles)	149.59	7.49	128.20	5.07	20	2.05	8	10.5	42	3.97	16	50.3	0	86
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	
Utility Lines (miles)	46.32	0	46.19	1.56	.078	0	0	2.31	.12	0	0	5.11	20.5	21.35
Other Utility Lines (miles)	131.21	0	127.84	0	0	1.04	52k	18.5	.93	0	0	43.3	2.16	4.123
HAZARDS														
Flood Zones (sq miles)	155.65	1.02	153.34											
Land Slides (sq miles)	224.12	.08	223.85											
Problem Soils (sq miles)	445.65	2.55	443.09											
Volcanic Flows (sq miles)	32.83	00	32.68											
Wildfires (sq miles)	1013.31	13.31	1000											

Wildfire

FEMA Hazard Profile

Frequency: Likely (drought patterns are cyclical)
Severity: Negligible to structures in incorporated communities and Moderate to High to structures in unincorporated Kane County.
Duration: Containment time varies for each fire.

Assessing Vulnerability

Overall Summary of Impacts

Wildfires occur every year in the United States. Factors that influence the potential for wildfires include: type, amounts and conditions of fuel supply (vegetation); temperatures; wind conditions; precipitation patterns; humidity levels; topography and the levels of human activity on the land. Fires in areas of heavy vegetation, if not quickly detected and suppressed can quickly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property.

Most rural wildfires result from thunderstorm activity. In addition, other wildfires are started by acts of human carelessness during activities such as controlled burns of forest areas; burning of ditch banks and fields by landowners; recreational activity such as camping, hunting, and other off-road vehicle travel; and use of both legal and illegal fireworks.

The Five County Association of Governments GIS, utilizing available data, has identified residential and commercial structures at moderate or high risk from wildfire. See Table 49 below for an analysis of wildfire risk in Kane County.

In unincorporated Kane County there are 91 residential structures at moderate risk from wildfire. Based upon figures provided by the Kane County Assessors Office, the market value of those structures is estimated to be $2,101,653. There are 8 residential structures at high risk from wildfire. Based upon figures provided by the Kane County Assessors Office, the market value of those structures is estimated to be $183,023. Based upon the average household size of 2.67 persons, in Kane County, from the 2000 U.S. Census, there are approximately 264 persons residing full or part time in a structure at moderate or high risk from wildfire. This is 26.93% of the 980 population of unincorporated Kane County. There are approximately 243 persons at moderate risk of wildfire. There are approximately 21 persons at high risk of wildfire.

In the town of Glendale there are 43 residential units in high wildfire risk area with an estimated market value of $2,786,200. This is 27.92% of the residential units in the town. There are approximately 132 persons (37.16% of the Town's population) at high risk from wildfire.

In Kanab City there are 5 residential units in a moderate wildfire risk area with an estimated market value of $400,341. This is 0.35% of the residential units in the city. There are approximately 13 persons (0.36% of the City's population) at risk from wildfire.

In the town of Orderville there are 11 residential units in a moderate wildfire risk area with an estimated market value of $662,693. This is 4.43% of the residential units in the city. There are approximately 34 persons (5.70% of the town's population) at moderate risk from wildfire. There are 60 residential units in a high wildfire risk area with an estimated market value of $3,613,342. This is 24.19% of the residential units in the city. There are approximately 184 persons (30.87% of the City's population) at risk from wildfire.

Number of People/Buildings Impacted by Wildfire

Table 49 Analysis of Wildfire Risk in Kane County

Alton - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	57	0	0%	$2,957,595	$0	0%	134	0	0%
Commercial	1	0	0%	$1,136,763	$0	0%	N/A	N/	N/A
Total	58	0	0%	$4,094,358	$0	0%	134	0	0%

Big Water – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	274	0	0%	$12,996,303	$0	0%	417	0	0%
Commercial	33	0	0%	$6,418,007	$0	0%	N/A	N/A	N/A
Total	307	0	0%	$19,414,310	$0	0%	417	0	0%

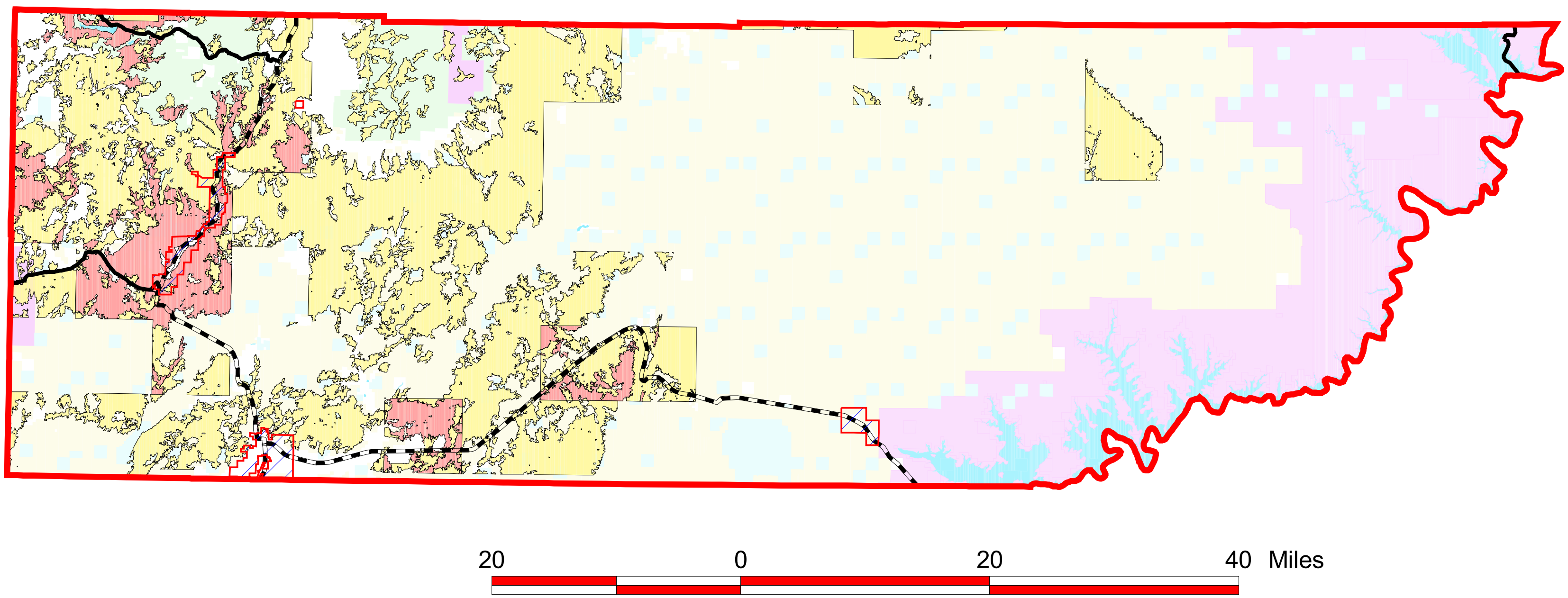
Glendale - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	154	43	27.92%	$9,979,229	$2,786,200	27.92%	355	132	37.18%
Commercial	10	0	0%	$705,510	$0	0%	N/A	N/A	N/A
Total	164	43	26.21%	$10,684,739	$2,786,200	26.07%	355	132	37.18%

Kanab - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1426	5	0.35%	$114,383,283	$400,341	0.35%	3564	13	0.36%
Commercial	145	0	0%	$31,714,052	$0	0%	N/A	N/A	N/A
Total	1571	5	0.31%	$146,097,335	$400,341	0.27%	3564	13	0.36%

Orderville - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	248	71	28.62%	$14,940,725	$4,276,035	28.62%	596	218	36.57%
Commercial	31	0	0%	$5,564,571	$0	0%	N/A	N/A	N/A
Total	279	71	25.44%	$20,505,296	$4,276,035	20.85%	596	218	36.57%

Unincorporated Kane County areas - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2624	99	3.77%	$60,601,537	$2,284,677	3.77%	980	264	26.93%
Commercial	68	0	0%	$26,671,445	$0	10.30%	N/A	N/A	N/A
Total	2692	99	3.67%	$87,272,982	$2,284,677	2.61%	980	264	26.93%

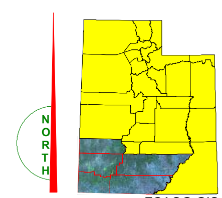
Kane County
Wildfire Map



Five County Association of Governments August 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us



Landslides

FEMA Hazard Profile
Frequency: Likely
Severity: Negligible to severe
Duration: range from very short duration slope failures to long-term ground movement. Duration varies by location.

Assessing Vulnerability

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available data, has identified areas at risk from landslide residential and commercial structures at risk from landslide. See Table 50 for an analysis of landslide risk in Kane County.

According to the available data, there is one residential structure at risk from landslide in unincorporated Kane County. This is 0.03% of the residential units in unincorporated Kane County. The market value of this structure is estimated to be $23,095.

There are 11 residential structures at risk from landslide in Orderville. This is 4.43% of the residential units in Orderville. The market value of those structures is estimated to be $661,874.

Available data indicates that there appears to be no commercial structures at risk from landslide in Kane County.

Number of People/Buildings Impacted by Landslides

Table 50 Analysis of Landslide Risk in Kane County

Alton - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	57	0	0%	$2,957,595	$0	0%	134	0	0%
Commercial	1	0	0%	$1,136,763	$0	0%	N/A	N/	N/A
Total	58	0	0%	$4,094,358	$0	0%	134	0	0%

Big Water – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	274	0	0%	$12,996,303	$0	0%	417	0	0%
Commercial	33	0	0%	$6,418,007	$0	0%	N/A	N/A	N/A
Total	307	0	0%	$19,414,310	$0	0%	417	0	0%

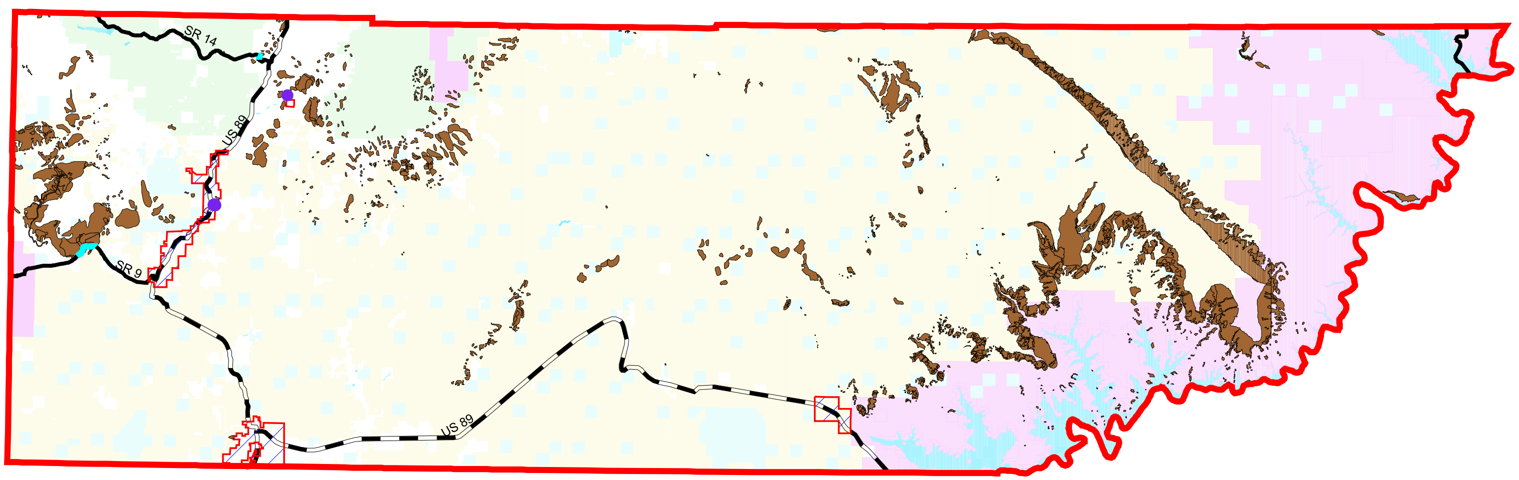
Glendale - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	154	0	0%	$9,979,229	$0	0%	355	0	0%
Commercial	10	0	0%	$705,510	$0	0%	N/A	N/A	N/A
Total	164	0	0%	$10,684,739	$0	0%	355	0	0%

Kanab - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1426	0	0%	$114,383,283	$0	0%	3564	0	0%
Commercial	145	0	0%	$31,714,052	$0	0%	N/A	N/A	N/A
Total	1571	0	0%	$146,097,335	$0	0%	3564	0	0%

Orderville - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	248	11	4.43%	$14,940,725	$661,874	4.43%	596	34	5.7%
Commercial	31	0	0%	$5,564,571	$0	0%	N/A	N/A	N/A
Total	279	11	3.94%	$20,505,296	$661,874	3.23%	596	34	5.7%

Unincorporated Kane County areas - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2624	1	0.03%	$60,601,537	$23,095	0.03%	980	3	0.30%
Commercial	68	0	0%	$26,671,445	$0	0%	N/A	N/A	N/A
Total	2692	1	0.03%	$87,272,982	$23,095	0.02%	980	3	0.30%

Kane County
Landslide Map



20 0 20 40 Miles

Kane County Boundary

Towns

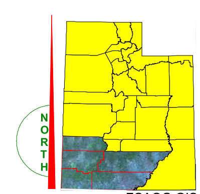
Landslides

Major Roads

State Route

US Route

* Note: Administrative Ownership is the background layer



Five County Association of Governments August 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Earthquake

Assessing Vulnerability and Overall Summary of Impacts

HAZUS MH Earthquake Vulnerability Assessment

See Table 51 below for an estimate of earthquake casualties.

Table 51 Earthquake Casualties Risk in Iron County

Casualties	Nighttime –Minor	32
	Nighttime –Major	1
	Nighttime -Fatalities	1
	Daytime –Minor	35
	Daytime –Major	1
	Daytime- Fatalities	2
	Commute –Minor	30
	Commute –Major	1
	Commute-Fatalities	2

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 52 below lists the number buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 52 Building Damage from Moderate to Complete by Count

Category	Number of Structures	Total Cost in millions of dollars **
Residential	511	38.28
Commercial	16	9.82
Industrial	0	1.14
Totals	1,266*	50.93**

*****Includes all building categories with moderate to complete damage
** Structural, non-structural, content, inventory

Table 53 Damage to Critical Facilities from Moderate to Complete

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	1	0	0	0
Schools	7	0	0	0
EOCs	1	0	0	1
Police Stations	3	0	0	0
Fire Stations	1	0	0	1

Debris Removal –Table 54 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 54 Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	40
Loads (25 tons per load)	1,600

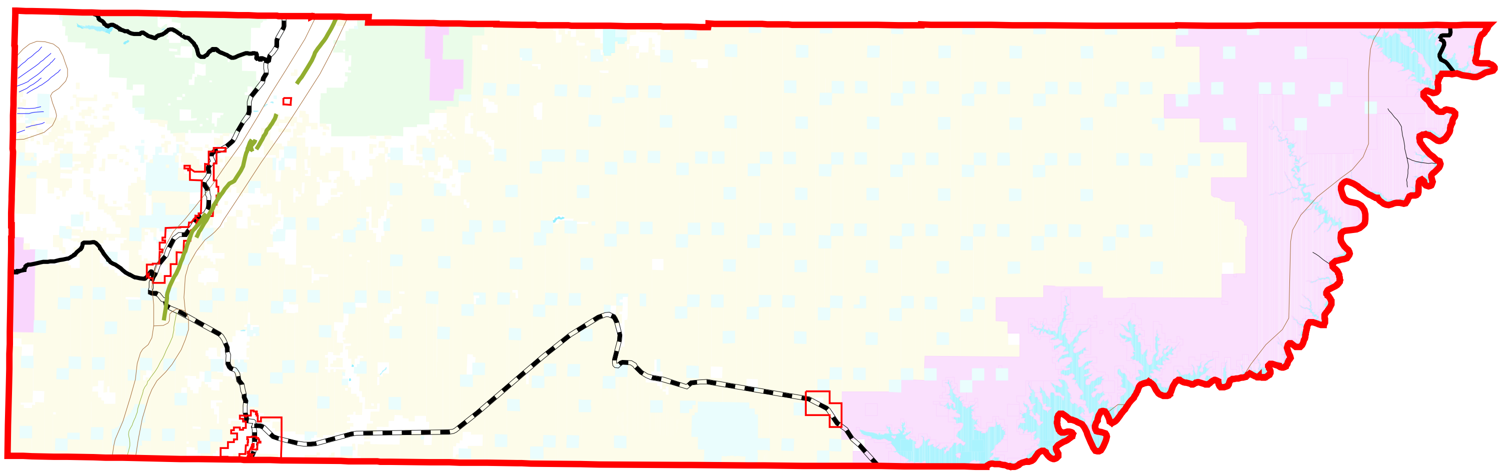
Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 55 below provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 55 Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	1
People Displaced	0
Value Exposed (mill. $)	0

These numbers were derived from a HAZUS MH run based on a probabilistic 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete HAZUS MH run performed by the Utah Division of Emergency Services and Homeland Security is available at the Five County Association of Governments.

Kane County
Earthquake Map



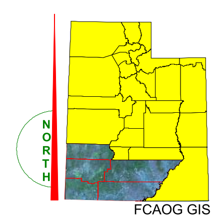
8 0 8 16 24 Miles

County Boundaries
Towns

Major Roads
I-15
State Route
US Route
Fault Groups

Folds
Fault Lines
123 = Latest Quaternary (<15,000 years)
124 = Latest Quaternary (<15,000 years)
133 = Late Quaternary (<130,000 years)
134 = Late Quaternary (<130,000 years)
144 = Mid to Late Quaternary (<750,000 years)
154 = Quaternary (<1,600,000 years)

* Note: Administrative Ownership is the background layer



Five County Association of Governments September 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Flood

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe depending on location.
Duration: range from very short duration flash flooding to longer-term inundation. Duration varies by location.

Assessing Vulnerability

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available floodplain data, has identified residential and commercial structures located within the 100-year floodplain (A Zone). See Table 56 below for an analysis of flood risk in Kane County.

Based upon review of available data, in the town of Glendale there are 62 residential structures located in a Floodplain (A Zone). Based upon an average market value of residential structures in the town, the market value of those structures is approximately $4,017,611. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.06 persons per household in Glendale, there are approximately 189 persons at risk from floodplains.

Based upon review of available data, in the town of Orderville there are 108 residential structures located in a Floodplain (A Zone). Based upon an average market value of residential structures in the town, the market value of those structures is approximately $6,506,444. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.07 persons per household in Orderville, there are approximately 331 persons at risk from floodplains.

Based upon review of available data, in Kanab City there are 87 residential structures located in a Floodplain (A Zone). Based upon an average market value of residential structures in the town, the market value of those structures is approximately $6,978,503. Based upon an average household size (U.S. Census Bureau, Census 2000) of 2.64 persons per household in Kanab, there are approximately 229 persons at risk from floodplains.

Based upon review of available data, in unincorporated Kane County there are 16 residential structures located in a Floodplain (A Zone). Five of these structures are located in unincorporated area just north of Kanab City. The other eleven structures are located in Johnson Canyon area. Based upon an average market value of residential structures in unincorporated Kane County, the market value of those structures is approximately $369,521. Based an average household size (U.S. Census Bureau, Census 2000) of 2.67 persons per household in Kane County, there are approximately 43 persons at risk from floodplains.

Number of People and Buildings/Structures Impacted by Floodplains

Table 56 Analysis of Flood Risk in Kane County

Alton - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	57	0	0%	$2,957,595	$0	0%	134	0	0%
Commercial	1	0	0%	$1,136,763	$0	0%	N/A	N/A	N/A
Total	58	0	0%	$4,094,358	$0	0%	134	0	0%

Big Water – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	274	0	0%	$12,996,303	$0	0%	417	0	0%
Commercial	33	0	0%	$6,418,007	$0	0%	N/A	N/A	N/A
Total	307	0	0%	$19,414,310	$0	0%	417	0	0%

Glendale - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	154	62	40.26%	$9,979,229	$4,017,611	40.26%	355	189	53.24%
Commercial	10	0	0%	$705,510	$0	0%	N/A	N/A	N/A
Total	164	62	37.80%	$10,684,739	$4,017,611	37.60%	355	189	53.24%

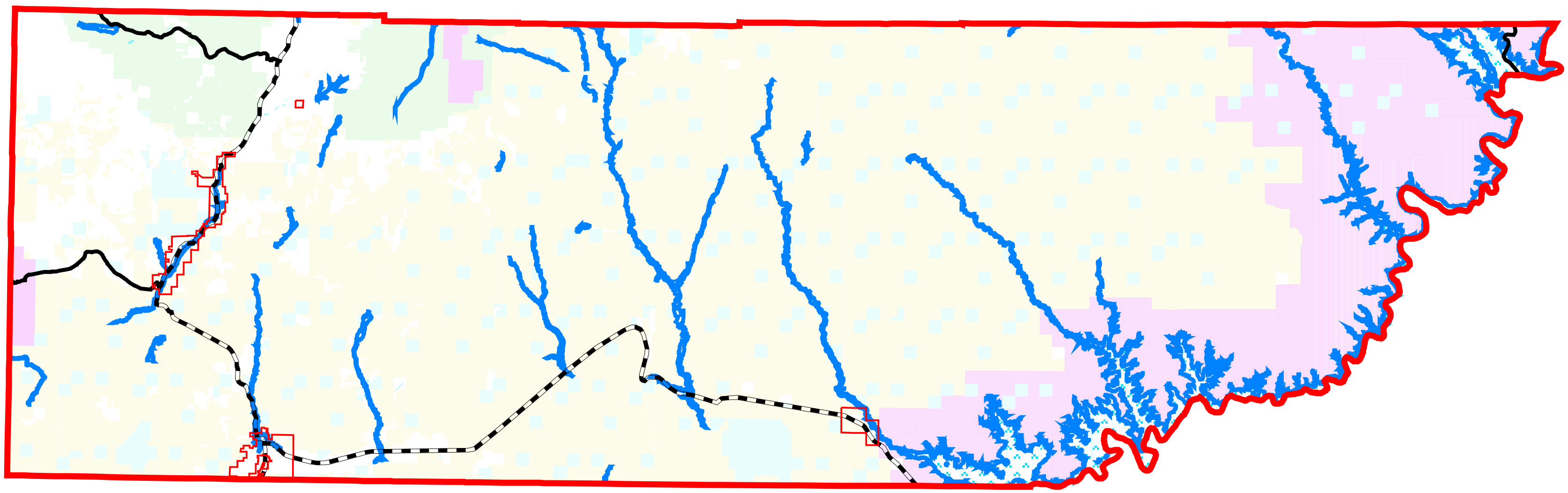
Kanab - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1426	87	6.10%	$114,383,283	$6,978,503	6.10%	3564	229	6.42%
Commercial	145	8	5.51%	$31,714,052	$1,749,740	5.51%	N/A	N/A	N/A
Total	1571	95	6.04%	$146,097,335	$8,728,243	5.97%	3564	229	6.42%

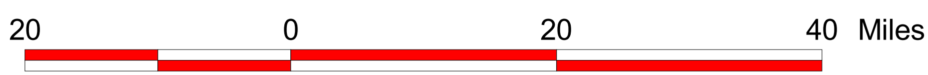
Orderville - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	248	108	43.54%	$14,940,725	$6,506,444	43.54%	596	331	55.53%
Commercial	31	10	32.25%	$5,564,571	$1,795,022	32.25%	N/A	N/A	N/A
Total	279	118	42.29%	$20,505,296	$8,301,466	40.48%	596	331	55.53%

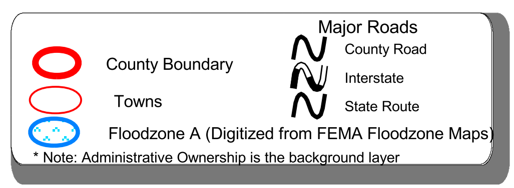
Unincorporated Kane County areas - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2624	16	0.60%	$60,601,537	$369,521	0.60%	980	43	4.38%
Commercial	68	0	0%	$26,671,445	$0	0%	N/A	N/A	N/A
Total	2692	16	0.59%	$87,272,982	$369,521	0.42%	980	43	4.38%

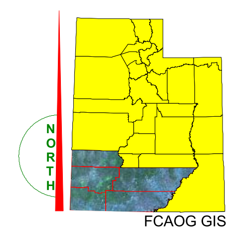
Kane County

Floodzone Map









Five County Association of Governments September 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

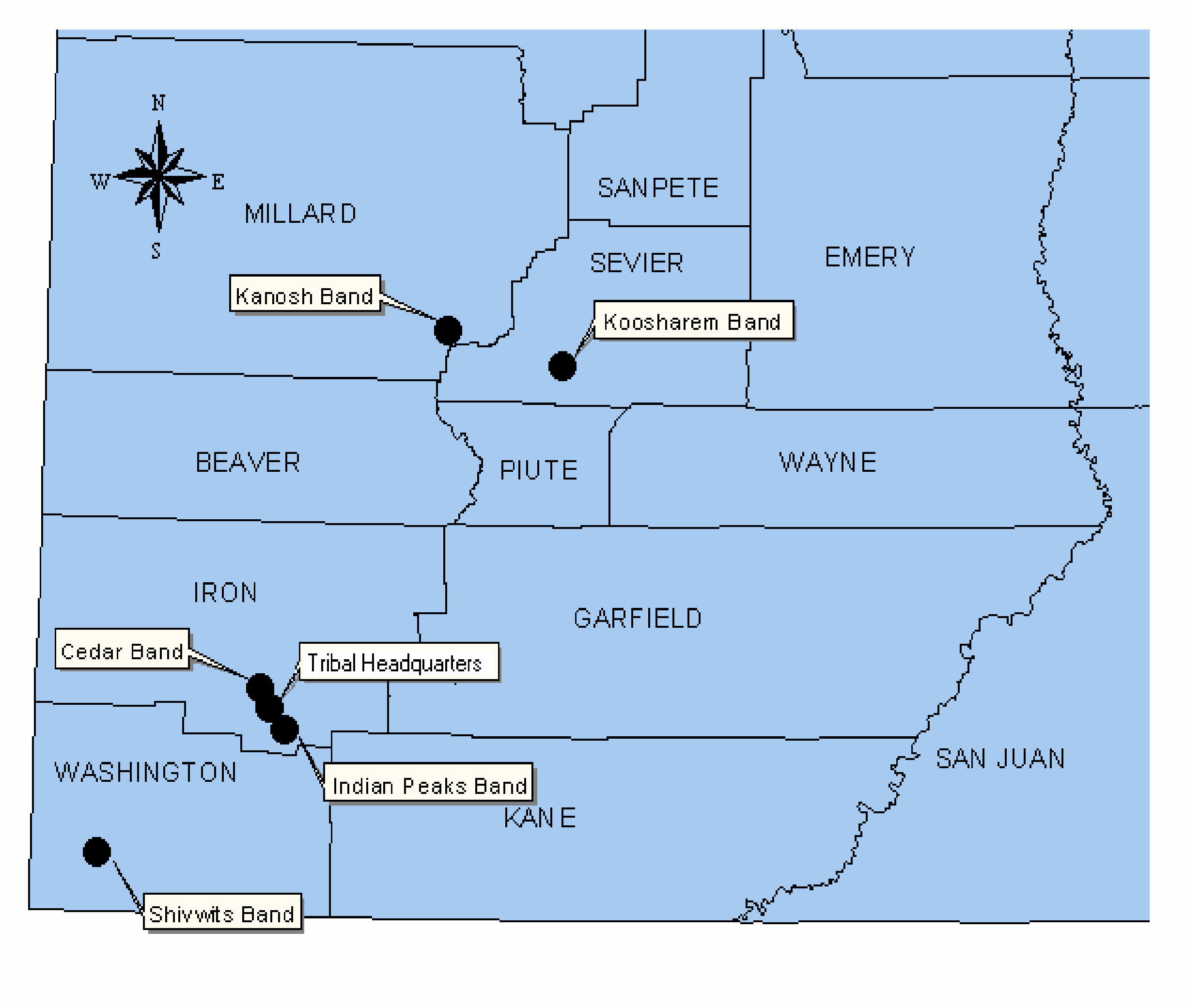
435-673-3548 email edickie@fcaog.state.ut.us

Paiute Indian Tribe Of Utah

Introduction

Location - The Tribal headquarters of the PITU is located in Southeastern Iron County approximately 280 miles South of Salt Lake City on Interstate Highway 15, and adjacent to Cedar City. The geographic location of Tribal Headquarters in relation to the five bands are approximately 84 miles from Shivwits, 5 miles from Indian Peaks and Cedar Band, 115 miles from Koosharem, and 105 miles from Kanosh. All are paved roads with good access. Figure 8, below, PITU Tribal Lands, shows the location of tribal lands in relation to Southern and Central Utah.

Figure 8: PITU Tribal Lands



Land Use - Reservation lands of the PITU encompass a total of 32,480 acres. Other than 35 acres of land housing the tribal headquarters and controlled by the Tribal Council, the other 32,445 acres are maintained and controlled by the five tribal bands (see PITU Reservation Lands Comparison). Results of a recent economic development survey revealed that tribal members feel their culture and land are their two greatest strengths ix B).

The majority of survey respondents felt that preservation of reservation lands was most important with planned industrial and community development. Each band's CEDS outlines their respective designation of land use (see Appendices C,D,E,F and G). The graph in

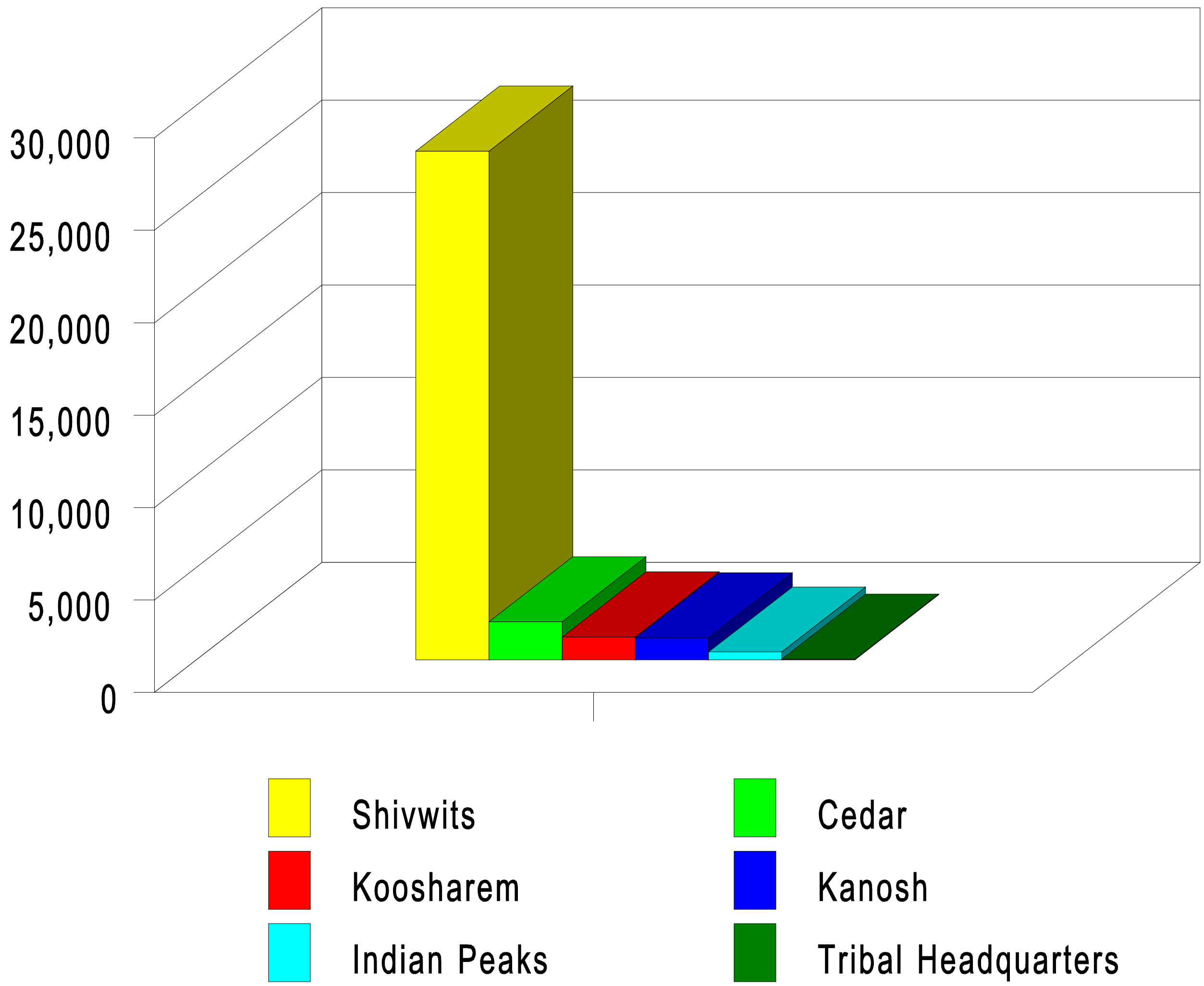


Figure 9, PITU Reservation Lands, compares the land holdings of each band which makes up the PITU reservation.

Figure 9: **PITU Reservation Lands**

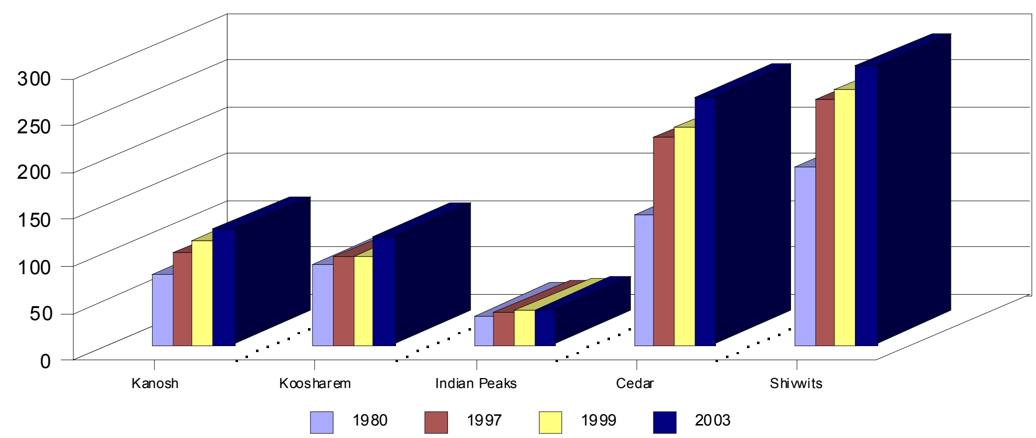
Table 57, PITU Reservation Land Comparison, identifies the actual land acreage of the PITU reservation. This chart compares land acreage of the five bands of the PITU along with the total acreage of State of Utah. Each band has completed a land use plan and is responsible for their respective land use development. Copies of these plans are available for review at the Tribal offices or through individual band councils.

Table 57 - PITU Reservation Land Comparison

Place	Acres
Shivwits Reservation	27,525
Cedar Reservation	2,060
Koosharem Reservation	1,240
Kanosh Reservation	1,195
Indian Peaks Reservation	425
Tribal Headquarters	35
Total Land Holdings of the PITU	**32,480**
State of Utah	54,021,252

Band Membership - According to the July 1999 PITU Tribal enrollment there are 741 members. This compares to 516 in 1980. The graph in Figure 10, below, PITU Population, shows the population trend since 1980.

Figure 10 - PITU Population



Source: 1980"Proposed PITU Reservation Plan," by US. Dept. Of the Interior, Bureau of Indian Affairs; data was compiled by Geneal Anderson and Gerald Kanosh, July 1999; 2003 estimates compiled by Six County Planning Staff.

Table 58, PITU Membership, shows the tribal enrollment according to age and gender. Fifty-seven percent (57%) or 421 members are included in the workforce which is sufficient to support a sizable business owned and employed by Tribal members. Table 59, PITU Membership Trends, evaluates membership trends of each band in the PITU.

Table 58 - PITU Membership

Age	Females	Males
1-5	39	37
6-10	49	44
11-15	44	62
16-20	42	47
21-25	38	39
26-30	44	27
31-40	65	44
41-50	67	52
51-60	31	27
Over 60	15	20
Totals	**434**	**399**

Source: PITU Health Department records, 1999; Six County Planning Estimates for 2003; Totals may not add due to rounding.

Table 59 PITU Membership Trends

Band	1980	1997	1999	2003
Kanosh	74	97	110	122
Koosharem	85	92	94	115
Indian Peaks	30	33	35	36
Cedar	138	220	231	264
Shivwits	189	260	271	296
PITU Total	**516**	**702**	**741**	**833**

Source: PITU Health Department records, 1999; and Six County Planning Estimates for 2003.

Currently 17% of Tribal members are living outside of the counties encompassing reservation lands. The PITU Habitat Chart, Figure 11, graphically displays the current membership who live within and outside of the area. Tribal leadership would like to see improved conditions through economic and community development that would allow members to reside on the reservation.

Figure 11 PITU Habitat Chart

Source: PITU Health Department records, 1999

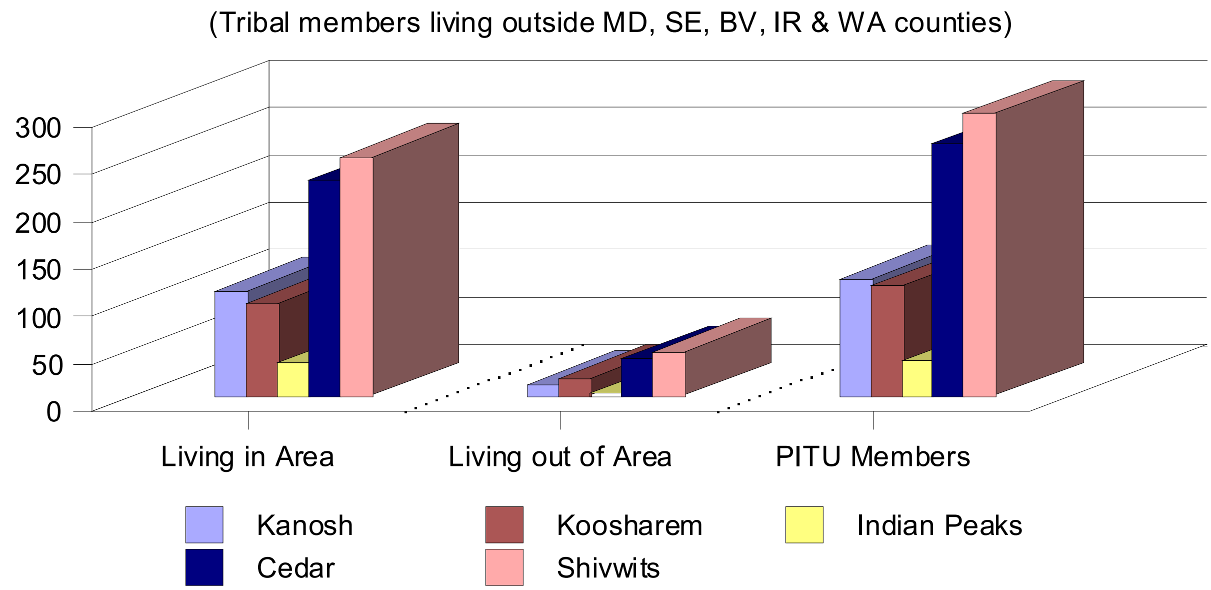


Table 60 below PITU Habitat Chart, provides a comparison of membership of Tribal members living out of the area. Lack of affordable housing and employment seem to be the major reasons for those leaving and living away from the reservation. Another major concern of Tribal leadership is the loss of heritage and cultural values that are disappearing as a result of members living and working outside of the area.

Table 60 - PITU Habitat Chart

Band	In Area	Out of Area	Total Members
Kanosh	110	12	122
Koosharem	97	18	115
Indian Peaks	34	2	36
Cedar	226	38	264
Shivwits	250	46	296
PITU Totals	**717**	**116**	**833**

Land Utilization

The tribal government of PITU does not control reservation lands. Each of the five constituent bands are responsible for their respective land preservation or development. Needed infrastructure to support community and economic development are the responsibility of each band and supported by Tribal Council of the PITU. Concerns among tribal members include affordable housing, water development, industrial zoning, natural resource use and preservation. A general land use plan for the PITU has been developed.

This document should be reviewed to understand current infrastructure and land utilization. Copies of the plan may be reviewed at the Tribal or band headquarters.

Political Environment

Tribal council members are elected to four year terms and meet on a monthly basis. Presently, the Council directs the economic development efforts through the Paiute Economic Development Committee (PEDCO) and are pro-active in achieving and attaining planned growth. They are interested in the development of industry that utilizes their natural resources and heritage, and that will enhance their standard of living through the creation of family sustaining employment. Through a collaborative effort with other local, state, and federal governments the Council is striving to overcome major stumbling blocks including lack of education, underemployment, social ills, lack of business skills, and strained relationships with neighboring cities, counties, and tribe.

Conclusion

The PITU has a rich heritage disrupted by the cultural changes brought by modern society. Nearly wiped out as a people – historically – due to poor economic and living conditions, the PITU has adopted a pro-active position in economic and community development. The development of this CEDS is the first step in achieving their goals toward enhancing their quality of life through the development of family sustaining employment for their members. The implementation of the goals, objectives, and strategies set forth by this document will perpetuate the planning process for the PITU as they strive to meet their economic development endeavors.
(Information regarding the Paiute Tribe of Utah was compiled by the Six County Association of Governments)

Analysis of Infrastructure of Paiute Nation

PITU Lands	X	PITU Land Total	X	Flood Zone Total	Flood Zone Costs in Millions $	Land Slide Total	Land slide Costs in Millions $	Problem Soil Total	Problem Soil Costs in Millions $	Volcanic Flow Total	Volcanic Flow Costs in Millions $	Wildfire total	Wildfire Costs in Millions $	Total Hazard Costs in Millions
# of Dams	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	0	.08	0											
Land Slides (sq miles)	0	0	0											
Problem Soils (sq miles)	0	0	0											
Volcanic Flows (sq miles)	0	0	0											
Wildfires (sq miles)	0	0	0											

Name of Band **INDIAN PEAKS**	**X**	**Indian Peaks Band Total**	**X**	**Flood Zone Total**	**Flood Zone Costs in Millions $**	**Land Slide Total**	**Land Slide Costs in Millions $**	**Problem Soil Total**	**Problem Soil Costs in Millions $**	**Volcanic Flow Total**	**Volcanic Flow Costs in Millions $**	**Wildfire Total**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	0	0	0											
Land Slides (sq miles)	0	0	0											
Problem Soils (sq miles)	0	0	0											
Volcanic Flows (sq miles)	0	0	0											
Wildfires (sq miles)	0	.67	0											

Name of Band **CEDAR**	x	Cedar Band Total	x	Flood Zone Total	Flood Zone Costs in Millions $	Land Slide Total	Land Slide Costs in Millions $	Problem Soil Total	Problem Soil Costs in Millions $	Volcanic Flow total	Volcanic Flow Costs in Millions $	Wildfire Total	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	0	0	0	0	0	0	0	0	0	0	0	2	0	0
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	0	1.16	0	0	0	.28	1	0	0	0	0	1.16	0	1
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	0	.38	0	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	0	0	0											
Land Slides (sq miles)	0	.14	0											
Problem Soils (sq miles)	0	0	0											
Volcanic Flows (sq miles)	0	0	0											
Wildfires (sq miles)	0	2.92	0											

Name of Band **SHIVWITS**	X	**Shivwits Band Total**	X	**Flood Zone Total**	**Flood Zone Costs in Millions $**	**Land Slide Total**	**Land Slide Costs in Millions $**	**Problem Soil Total**	**Problem Soil Costs in Millions $**	**Volcanic Flow Total**	**Volcanic Flow Costs in Millions $**	**Wildfire Total**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams	0	0	0	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	0	2	0	2	10	0	0	0	0	0	0	1	0	10
# of Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	0	8.82	0	.74	3	0	0	3.53	14	0	0	8.82	0	17
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	0	1.3	0											
Land Slides (sq miles)	0	1.22	0											
Problem Soils (sq miles)	0	21.37	0											
Volcanic Flows (sq miles)	0	0	0											
Wildfires (sq miles)	0	39.92	0											

Wildfire

FEMA Hazard Profile

Frequency: Likely (drought patterns are cyclical)
Severity: Negligible to moderate to structures on Paiute Indian Tribe of Utah land. Moderate to high on land nearby.
Duration: Containment time varies for each fire.

Assessing Vulnerability: Identifying Assets and Estimating Losses

Overall Summary of Impacts

Wildfires occur every year in the United States. Factors that influence the potential for wildfires include: type, amounts and conditions of fuel supply (vegetation); temperatures; wind conditions; precipitation patterns; humidity levels; topography and the levels of human activity on the land. Fires in areas of heavy vegetation, if not quickly detected and suppressed can quickly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property.

Most rural wildfires result from thunderstorm activity. In addition, other wildfires are started by acts of human carelessness during activities such as controlled burns of forest areas; burning of ditch banks and fields by landowners; recreational activity such as camping, hunting, and other off-road vehicle travel; and use of both legal and illegal fireworks.

The Five County Association of Governments GIS, utilizing available data, has identified residential and commercial structures at moderate or high risk from wildfire.

Within Shivwits Band lands of the Paiute Indian Tribe of Utah there are 24 residential structures at moderate risk from wildfire. According to information provided by the Paiute Indian Tribe of Utah, the value of these structures is estimated at $2,400,000.00. Approximately 96 persons are at moderate risk from wildfire.

Paiute Indian Tribe of Utah, Cedar Band – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	38	0	0%	$0	$0	0%	152	0	0%
Commercial	0	0	0%	$0	$0	0%	N/A	N/A	N/A
Total	38	0	0%	$0	$0	0%	152	0	0%

Paiute Indian Tribe of Utah, Indian Peaks Band – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	6	0	0%	$600,000	$0	0%	24	0	0%
Commercial	0	0	0%	$0	$0	0%	N/A	N/A	N/A
Total	6	0	0%	$600,000	$0	0%	24	0	0%

Paiute Indian Tribe of Utah, Shivwits Band – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	24	24	100%	$2,400,000	$2,400,000	100%	96	96	100%
Commercial	0	0	0%	$0	$0	0%	N/A	N/A	N/A
Total	24	24	100%	$2,400,000	$2,400,000	100%	96	96	100%

Landslide

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to any structures on Paiute Indian Tribe of Utah land.
Duration: range from very short duration slope failures to long-term ground movement. Duration varies by location.

Assessing Vulnerability: Identifying Assets and Estimating Losses

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available data, has identified areas at risk from landslide residential and commercial structures at risk from landslide.

The population and value estimates were provided by the Paiute Indian Tribe of Utah. According to the available data, there are no residential structures at risk from landslide in any of the Paiute Indian Tribe of Utah lands. The same data also indicates that there are no commercial structures at risk from landslide on the tribal lands.

Number of People and Buildings/Structures Impacted by Landslide

Paiute Indian Tribe of Utah, Cedar Band – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	38	0	0%	$3,800,000	$0	0%	152	0	0%
Commercial	0	0	0%	$0	$0	0%	N/A	N/A	N/A
Total	38	0	0%	$3,800,000	$0	0%	152	0	0%

Paiute Indian Tribe of Utah, Indian Peaks Band – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	6	0	0%	$600,000	$0	0%	24	0	0%
Commercial	0	0	0%	$600,000	$0	0%	N/A	N/A	N/A
Total	6	0	0%	$600,000	$0	0%	24	0	0%

Paiute Indian Tribe of Utah, Shivwits Band – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	24	0	0%	$2,400,000	$0	0%	96	0	0%
Commercial	0	0	0%	$2,400,000	$0	0%	N/A	N/A	N/A
Total	24	0	0%	$2,400,000	$0	0%	96	0	0%

Flood

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe depending on location. Cedar Band is especially vulnerable.
Duration: range from very short duration flash flooding to longer-term inundation. Duration varies by location.

Assessing Vulnerability: Identifying Assets and Estimating Losses

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available data, has identified areas at risk from flooding of residential and commercial structures .

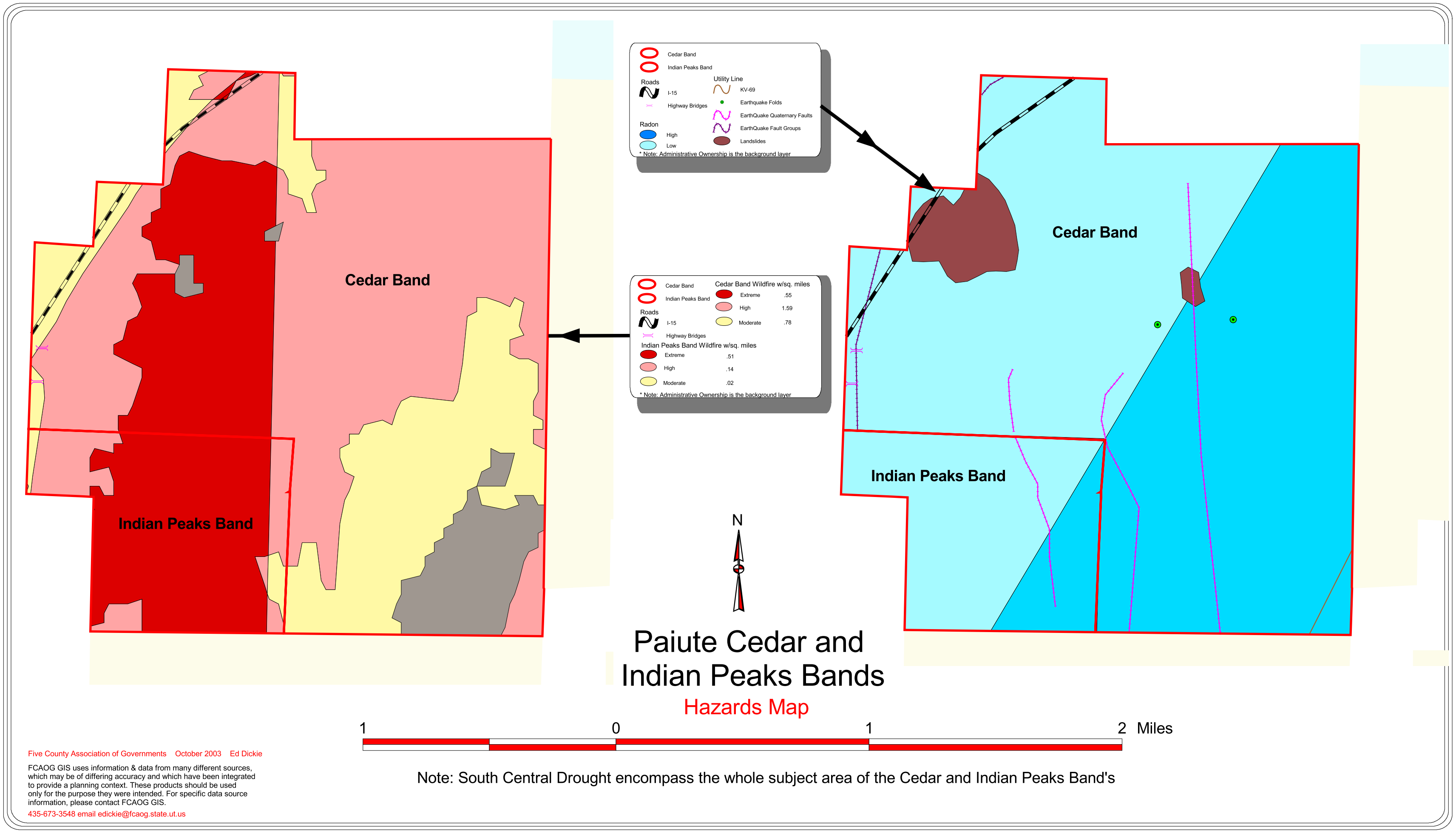
The population and value estimates were provided by the Paiute Indian Tribe of Utah. According to the available data, there are 36 residential structures at risk from landslide on Paiute Indian Tribe of Utah lands. The estimated value of those structures is $3,600,000.

Number of People and Buildings/Structures Impacted by Floodplains

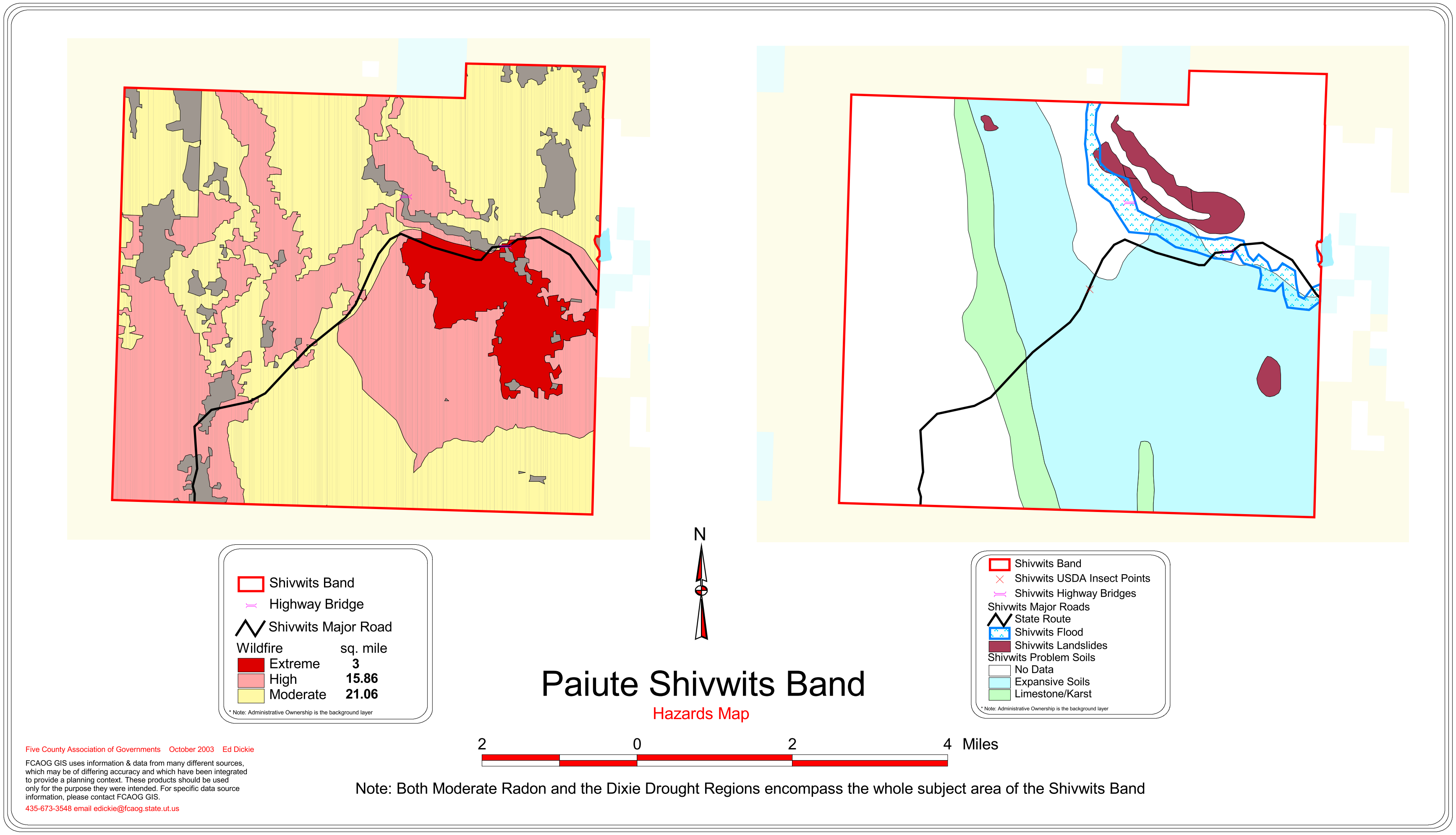
Paiute Indian Tribe of Utah, Cedar Band – Floodplain									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	38	36	94.73%	$3,800,000	$3,600,000	94.73%	152	144	94.73%
Commercial	0	0	0%	$0	$0	0%	N/A	N/A	N/A
Total	38	36	94.73%	$3,800,000	$3,800,000	94.73%	152	144	94.73%

Paiute Indian Tribe of Utah, Indian Peaks Band – Floodplain									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	6	0	0%	$600,000	$0	0%	24	0	0%
Commercial	0	0	0%	$0	$0	0%	N/A	N/A	N/A
Total	6	0	0%	$600,000	$0	0%	24	0	0%

Paiute Indian Tribe of Utah, Shivwits Band – Floodplain									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	24	0	0%	$2,400,000	$0	0%	96	0	0%
Commercial	0	0	0%	$0	$0	0%	N/A	N/A	N/A
Total	24	0	0%	$2,400,000	$0	0%	96	0	0%

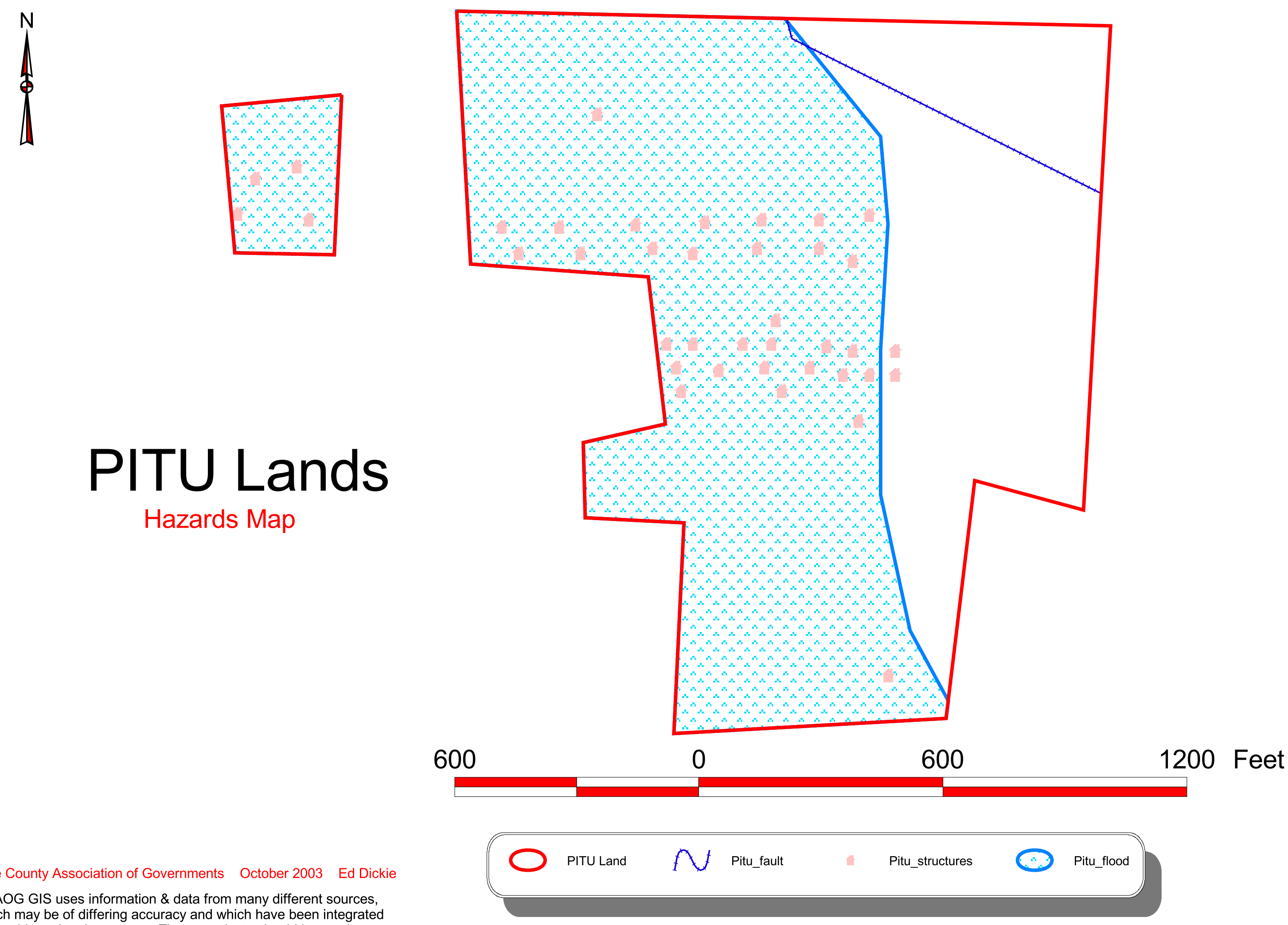


Cedar Band
Indian Peaks Band
Cedar Band
Indian Peaks Band
Roads
I-15
Highway Bridges
Radon
High
Low
Utility Line
KV-69
Earthquake Folds
EarthQuake Quaternary Faults
EarthQuake Fault Groups
Landslides
* Note: Administrative Ownership is the background layer
Cedar Band
Indian Peaks Band
Roads
I-15
Highway Bridges
Cedar Band Wildfire w/sq. miles
Extreme .55
High 1.59
Moderate .78
Indian Peaks Band Wildfire w/sq. miles
Extreme .51
High .14
Moderate .02
* Note: Administrative Ownership is the background layer
Cedar Band
Indian Peaks Band
N
Paiute Cedar and Indian Peaks Bands
Hazards Map
1 0 1 2 Miles
Note: South Central Drought encompass the whole subject area of the Cedar and Indian Peaks Band's
Five County Association of Governments October 2003 Ed Dickie
FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.
435-673-3548 email edickie@fcaog.state.ut.us


Shivwits Band
Highway Bridge
Shivwits Major Road
Wildfire sq. mile
Extreme 3
High 15.86
Moderate 21.06
* Note: Administrative Ownership is the background layer
N
Paiute Shivwits Band
Hazards Map
Shivwits Band
Shivwits USDA Insect Points
Shivwits Highway Bridges
Shivwits Major Roads
State Route
Shivwits Flood
Shivwits Landslides
Shivwits Problem Soils
No Data
Expansive Soils
Limestone/Karst
* Note: Administrative Ownership is the background layer
2 0 2 4 Miles
Five County Association of Governments October 2003 Ed Dickie
FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.
435-673-3548 email edickie@fcaog.state.ut.us
Note: Both Moderate Radon and the Dixie Drought Regions encompass the whole subject area of the Shivwits Band

PITU Lands

Hazards Map



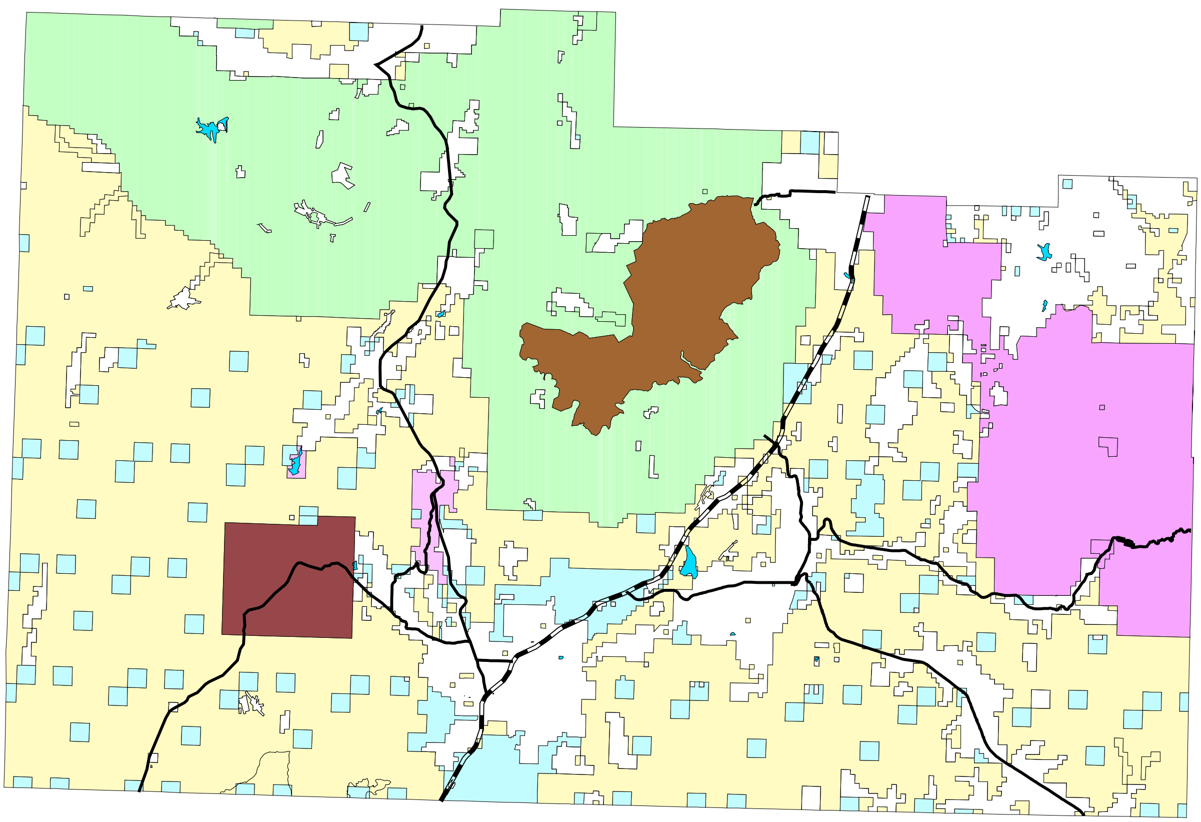
Note: Both Moderate Radon and South Central Drought encompass the whole subject area of the Pitu Band

Five County Association of Governments October 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Washington County



History

In 1847 members of The Church of Jesus Christ of Latter-day Saints settled in the Salt Lake Valley. Church leader, Brigham Young, sent settlers out from the Salt Lake Valley to settle other areas of the new territory. St. George was one such settlement.

In 1854 Brigham Young assigned Jacob Hamblin to be a missionary to the Indians in the southern parts of the territory. He was considered a great friend by the Indians and was heavily involved in keeping the peace between settlers and Native Americans. In 1861, Brigham Young sent 300 families to the St. George area to grow cotton and other products conducive to the climate. Many of these early settlers were from America's southern states and the area soon became know as "Dixie" because of its settlers, location, climate and agricultural products. Cotton, silk, dried fruit, molasses, and pecans were just some of the many products produced in the area.

The Utah territory was officially declared a state of the United States in 1896 and the St. George area is still widely known as "Utah's Dixie". It is here that Dixie State College was established. St. George was likely named after George A. Smith who was heavily involved in the selection of the families who settled the area in 1861 and was recognized as a great leader in the region.

Life in this arid climate was very difficult for the early pioneers. With intense summer heat and just a few inches of annual rainfall, farming was a difficult. Unusually heavy rains or flash floods often destroyed crops and buildings, but the settlers persevered and began to build a city. The climate of the region probably hasn't changed much, but the ability to cope with it in air conditioned comfort as well as its mild winter weather makes Utah's Dixie one of the most pleasant growing population centers in Utah.

Projections for the 1990s are that this growth rate will continue. The county is host to several outstanding events each year, including conferences and conventions, art festivals and art shows, golf tournaments, the Dixie Rotary Bowl Football Game, the St. George Marathon, and the World Senior Games.

The dominant industries of Washington County are tourism, retirement living, and golf.

St. George, the Washington County seat, is the southernmost city in Utah along the I-15 Corridor. St. George proximity to other Utah cities is below

Moab - 341 miles
Provo - 258 miles
Salt Lake City - 303 miles

The average temperature in January is 40º F, and the average July Temperature is 86º F. Annual Average Precipitation is 8".

Development Trends

Population

Population expansion is a major impetus behind the county’s economic growth. As the population continues to expand, the “big box” retailers have found Washington County more and more attractive. And, other businesses have found customers for their services. Just how fast has the population growth been? Recently released estimates from the U.S. Census Bureau tell us that almost 100,000 individuals lived in Washington County during 2002. That represents a 5-percent increase in population from 2001. Historically, Washington County's population has increased between 85 and 95 percent per decade for the last three decades. The only county in Utah with faster population growth in the 1990s was Summit County. While Ivins experienced the most rapid population boom between 1990 and 2000, St. George continued to attract the most new residents. Rockville and Enterprise were the slowest growing communities in the county. Yet, they still managed to increase their population bases by more than one-third. Population estimates for 2000 to 2002 also show Ivins with the most rapid population growth—22 percent in just two years.

One of the most startling changes the Census revealed was an increase in Washington County's Hispanic population. In 1990, less than 2 percent of the county's population was Hispanic. By 2000, that share had increased to more than 5 percent. Still, Washington County has not become a hotbed of diversity. Only 9 percent of the county's population is nonwhite or Hispanic compared to 31 percent nationally. Despite great in-migration of working-age individuals, Washington County saw its retirement-age population increase slightly during the 90s. Census data shows that 17 percent of the county's population is over the age of 65—compared to only 9 percent in Utah. In addition, Washington County's population is heavy on the young side. Roughly 31 percent of the population is 18 years old or younger, compared to 26 percent nationally. This age distribution means Washington County has a smaller-than-average working-age population to support its non-workers. Washington County's household size has decreased slightly over the 90s. However, Washington County families are more likely than Utah or U.S. families to be headed by a married couple. Moreover, only 7 percent of the county's families are headed by women with children compared to 8 percent in Utah and 11 percent nationally.

Educational status also improved during the last decade. In 2000, 88 percent of Washington County residents over the age of 25 had a high school diploma. But, while the share of the population with a college education increased to 21 percent in 2000, it still lags behind the state and national averages (26 and 24 percent respectively).

Labor Market Indicators

While both the nation and Utah showed a net employment loss during 2002, Washington County managed moderate job growth (4.5 percent). As in 2001, Washington County was the fourth-fastest growing county in the state in terms of job growth. And, just as in 2001, the lead counties were much smaller than Washington County. All in all, county employers added more than 1,600 net new jobs to their payrolls during 2002. During this time, the national industrial structure used to classify industries changed. The newly created industry of private education/health/social services added the most new Washington County jobs. These new positions were largely concentrated in health services and residential care (which includes teen help programs). However, transportation/trade/utilities ran a close "second" in the job-creation race. In fact, the only industry to lose employment was manufacturing, which suffered a small 20-job loss. That's not a bad record during a national recession.

Although the county created jobs at a healthy rate, unemployment did creep up during 2002. In 2001, the jobless rate measured 3.8 percent. The 2002 figure registered 4.6 percent.

However, please note that even with that increase, the jobless rate in Washington County remained more than a full percentage point below the state and national averages.

Recently released data from the 2000 Census shows that while labor force participation remains relatively low in Washington County (it's all those nonworking seniors), it did increase in the 1990s. In particular, women moved into the workforce in greater numbers. Not surprisingly, the census data also shows that more children under six have both parents in the workforce - almost half.

The economy staved off recessionary ills during 2002. Between 2001 and 2002, Washington County's average monthly nonfarm wage increased about 2 percent to measure $1,898. That is just ahead of inflation. In other words, the buying power of county workers improved slightly during 2002. However, the county maintained its status when compared to state wages. Washington County's average wage measured 76 percent of the state average—no different than in 2001. Lower wages are partially due to the county's heavy dependence on retail and tourism. Often, jobs created to fill these needs are typically lowpay and part-time. An abundant young workforce attending Dixie College also plays a part. And, even the expanding economy works to keep wages low. When new firms enter the area or expand, they often hire at the bottom of their payscales. Typically, the less urban the area, the lower the wages are.

With the new industrial coding structure, financial activities show the highest average monthly wages in the county—$2,305. However, information services, private education/health/social services, manufacturing, and government all showed average monthly wages above the $2,000 mark. Where's the lowest pay? The leisure/hospitality industry, which includes the tourism-related industries of recreation, lodging, and restaurants.

Measures of income (which includes interest income, rental income, business income, And government payments such as Social Security and welfare, as well as wages) also show Washington County with lower-than-average per capita and family income indicators. Interestingly, Washington County is unusual in that a high percentage of personal income comes from sources other than wages. Washington County estimates of poverty for individuals (11 percent) falls between the national rate (12 percent) and the state rate (9 percent). Poverty showed a noticeable decline in the 1990s.

Construction Permits

Construction bolstered the case for a strong Washington County economy in 2002. The value of both residential and nonresidential approved building permits reached all-time highs during 2002. While the number of homes permitted didn't touch 1994 levels, their number measured the highest since 1995. The St. George continued as the area of strongest residential expansion with Washington City running a distant second.

Taxable Sales

Taxable sales also contributed to a strong economy in Washington County in 2002. Sales continued to be robust during 2002 by showing a 9-percent increase over 2001. Business investment was particularly strong during 2002. While not totally unphased by the national recessionary ills, Washington County's economy remained healthy during 2002 with strong expansion in jobs, construction, and sales. As the nation begins its economic recovery, Washington County should continue to experience robust expansion in the years ahead.

Land Use Development

Residential development in Washington County is ongoing, primarily within incorporated communities. A majority of the industrial and commercial activities in the county are taking place in St. George, the county seat. The neighboring communities are seeing some of this development, especially Washington City and Hurricane City.

The following major development projects are planned or are under way in Washington County:

New Regional Airport

This replacement airport will provide safer, more convenient, air travel and will allow for economic growth and prosperity. Its estimated completion is 2010. Jerry Atkin, Chairman and CEO of SkyWest Airlines which has its headquarters in St. George, says that “A jet capable airport allows us to serve destinations further away than we are capable of today.” This new airport which will accommodate larger planes will bring a general upgrading to the community and to the types of jobs that are available. “A new airport is absolutely a key ingredient in being able to advance the area’s economy in a positive manner,” states Scott Hirschi, Director of the Washington County Council.

Dixie Regional Medical Center

Construction of the new Dixie Regional Medical Center (DRMC) has been completed on a 65 acres campus located at the northeast intersection of 700 South and River Road. Construction began in 2001 and was completed in late in 2003. Intermountain Health Care (IHC/DRMC) is the largest private employer in Washington County with more than 1,100 employees. The new facility expects an estimated 350 additional jobs will be created. When employment multipliers are factored in (these include the other jobs in the community that the two hospitals help sustain) the current hospital, being renovated for other hospital services, and the new facility, will be responsible for approximately 2,000 jobs and $101 million in household earnings in Washington County. The average wage paid to employees when the new campus is fully operational is estimated to be $41,262 or about 58% higher than the average wage in Washington County of $23,973.

Sunset Corner Lifestyle Center

Sunset Corner is located at the intersection of Sunset Blvd and Bluff Street, one of the busiest corners in St George. Fully developed the center will offer 320,000 sq feet of upscale retail space. It is now the home of the Stadium 8 Theaters, Village Bank, Panda Express, Peaks Wireless and several soon-to-be announced restaurants. Special features of this center will include generous landscaping, attractive and innovated water features, ample outside seating with shaded rest areas, a large electronic message center and an overall ambiance that does not currently exist in St George.

The Tonaquint Center

The Tonaquint Center on Dixie Drive aims to provide a blend of high-tech development and technology-based companies as well as upscale office space for financial, medical, legal and real estate professions. All buildings will have fiber internet access with speeds of up to 45 Mbps, making Tonaquint Center the premier high tech location in Southern Utah. The site is located close the Santa Clara River which gives it access to existing walkways for biking, jogging, and walking and the new Tonaquint Park’s tennis courts. Southgate and Sunbrook Golf Courses are located within one-quarter mile of the Center. Currently the Five County Association of Governments and Steton Technolgies occupy facilities in the development.

New Main Street Plaza
The Jennings Building or Main Street Plaza will be the “place to be” for businesses interested in having the best location for their high technology business. This four story building will offer tenants up to 80,000 sq ft of new high quality “Class A” office space. It is located on the corner of Main & Tabernacle and is scheduled to be completed in early spring of 2004. There are already commitments for over 60% of the available space.
The building is attracting high profile tenants in the professional, financial and service categories. Because of its unique position to the central hub for Qwest communications, this building is slated to be a leader in the “Smart Building” category with the latest in broadband technology. Adjacent to this building will be a four story parking garage that will service the needs of the office tenants and also provide a substantial amount of free public parking for visitors to other downtown building and attractions. It is designed to be the stimulus to rebuild the center core and “heart” of St. George.

Washington County Industrial Parks

Fort Pierce Industrial Park
This is St George City’s newest industrial park and home to Wells Dairy, manufacturer of Blue Bunny Ice Cream. In addition to being the newest, Fort Pierce has also had the most activity in relation to expansion of existing local businesses and is the best positioned industrial park in southern Utah to attract out of the area businesses. Key attractions are: close proximity to the new airport, the most favorable electrical power rates in the region and the willingness of the developing partners to accommodate the needs of prospective clients. Two more quality out-of-state companies are purchasing sizable parcels of land in Fort Pierce Industrial Park and are constructing new facilities scheduled to be operational by 2003. This business center has become the place for new industry and job creation in the manufacturing sector.

Gateway Business Park
Gateway Business Park is located near the intersection of I-15 and SR-9 in Hurricane City and is home to the 1.2 million SF WalMart Distribution Center. Nearly 200 acres are available which can be divided into building sites ranging in size from two acres to 50 acres. Some of the present tenants include: Crocker Enterprises, DATS Trucking, Pace American Trailer, Winkle Distributing, UP&L, and Mikohn (Gaming Worldwide). The Gateway is fully developed with all utilities in place. The pre-planning and zoning allows for speedy building permits.

Planned Communities

Outlaw Ridge Resort & Golf Community
This community’s master-plan envisions a destination resort at its core, complete with a first-class hotel which will feature a spa, tennis, two new Johnny Miller golf courses, the Johnny Miller Golf Academy and all other amenities associated with a destination resort. Miller will make Outlaw Ridge his “home course.” At this largest master-planned community in Southern Utah, over 4,000 housing units are planned with a complete range of choices. The Outlaw Ridge project will be unique, in that its proximity to the 1,350 acre Sand Hollow Reservoir and the surrounding 16,000 acre Sand Hollow State Park, will give both residents and resort patrons alike the opportunity to swim, boat, water-ski, fish, sail, ride horses and hike, all within minutes of their home or hotel.

Other large existing and expanding planned communities include:

Entrada (around the Johnny Miller, Entrada Golf Course and Snow Canyon Parkway),

Coral Canyon (Coral Canyon Golf Course and close to I-15 and the Hurricane City exit),

Sun River (an over 55 adult community built around the Sun River Golf Course south of Bloomington)

Sunbrook Communities (many separate communities built around the City of St George's Sunbrook Golf Course).

Development Activities

The following development activities have occurred in Washington County during the past year. While this is not an all-inclusive listing, it is indicative of the development trends occurring in Washington County.

Bucking turbulent conditions industry-wide, St. George-based SkyWest Airlines continues to fly high, reporting net income of nearly $15 million, or 26 cents a share, for the quarter ended June 30. That compares with income of $22 million, or 38 cents, for the same quarter a year ago. SkyWest said those results reflect previously announced adjustments to revenue and expenses related to the company's maintenance policy. The company's second-quarter revenue increased 12 percent to $212.7 million. Salt Lake Tribune, 7/31/03

The redesigned Interstate 15 interchange at Washington, (Exit 10), which has been under construction since April 2002, is now open. The design of the $9.8 million project will handle the flow of traffic more efficiently. Surface streets also have been widened and improved. Salt Lake Tribune, 7/29/03

The Washington City Council is wagering about $17,000 on the future of fiber optics, hoping the small investment will yield lucrative returns. The Council voted to enter into a change order agreement with the Washington Water Conservancy District and St. George, who are already in the process of constructing a fiber optic conduit line through the trenches of the water pipeline from Ivins to Quail Lake. Washington City will pay about 7 percent of the more than $200,000 needed for the conduit, entitling the city to a portion of any returns. There is no way of foretelling the future of fiber optics in the telecommunications industry in general, or the county specifically -- whether the conduit will facilitate business, or vice versa. But if demand is high, the fiber optic conduit could prove a profitable venture. The Spectrum, 7/24/03

SkyWest Airlines Inc., flexing its increasing strength in the regional commuter airline market, reported Tuesday that its passenger traffic for June was up more than a third from the same time a year ago. The St. George-based carrier registered a 39.3 percent increase last month in revenue passenger miles, a measure of available plane seats actually sold. Available seat miles -- a formula determining an airline's seating capacity -- increased 35.1 percent compared to June 2002. Salt Lake Tribune, 7/9/03

The federal government has designated the entire state of Utah a natural disaster area as a result of prolonged drought conditions, insect infestations and high winds. The designation makes farmers in all 29 counties eligible to be considered for low-interest emergency loans from the Farm Service Agency. Utah is in its fifth year of drought, and the USDA's Palmer drought index ranked the state the nation's driest. What's being offered is low-interest loans and possible future assistance when it is made available by federal and state agencies. Deseret News, 7/2/03

Five Utah parks have received $874,000 in matching grants from the National Park Service to build new picnic areas, playing fields, trails and other improvements. St. George's Slick Rock Park was awarded $90,000 under the program. Salt Lake Tribune, 6/28/03

The vacancy rate at St. George hotels/motels reached 60 percent in May according to the Rocky Mountain Lodging Report. Salt Lake Tribune 6/24/03

Coral Canyon Golf Course in Washington City earned a rating above 20 from the Zagat survey, qualifying it as one of the publication's top golf courses in 2003. In addition, Golf for Women magazine included Coral Canyon on its "50 Best Courses for Women in the U.S." list, and Golf Digest named it the fourth best golf course in Utah. Coral Canyon is owned and managed by SunCor Golf of Tempe, Ariz. Salt Lake Tribune, 6/24/03

A legislative mistake is holding up $500,000 in matching federal funds that would preserve a trove of fossils and petrified dinosaur tracks. U.S. Rep. Jim Matheson, D-Utah, said he plans to introduce a technical correction to a bill that instructs the Interior Department to buy land on the farm of Sheldon Johnson and deed it over to St. George. That $500,000 for the land is secure, but the Interior Department says a problem in the Virgin River Dinosaur Footprint Preserve Act signed by President Bush last December prevents the department from releasing another $500,000 to help preserve the fossilized findings. The Utah Legislature budgeted $400,000 to help build a museum. St. George Mayor Dan McArthur said the city will add $150,000. The city is reviewing building designs for a $700,000 museum that could open within a year, McArthur said. Salt Lake Tribune, 6/15/03

Local communities will soon benefit from a grant distributed by the Utah Department of Public Safety, Division of Emergency Services and Homeland Security. Region IV, which includes Beaver, Garfield, Iron, Kane and Washington counties, received $375,005 from the state homeland security grant, part of nearly $3.9 million awarded across the state. The 2003 grant came from the U.S. Department of Homeland Security, Office of Domestic Preparedness, according to a news release from the Department of Public Safety, Division of Emergency Services and Homeland Security. Region IV decided to use the money awarded to them to improve communications devices and purchase communication devices to allow cities to speak with other cities -- like St. George to Beaver. The Spectrum, 6/13/03

Washington County Board of Education members approved next year's $145 million budget. The district is projecting 3-percent growth in enrollment—about 600 students, or the equivalent of a new school. The district plans to sell around $25 million in bonds this year to fund several projects, including a new elementary school in the Washington Fields area to the east of St. George. Money to repay any bonds sold by the district will come from the county's projected growth in assessed valuation of property, which also is expected to rise next year by 2.3 percent. Any increase in revenue is welcome, especially since the school board earlier voted to increase student fees, raise the student to teacher ratio and cut two paid days from district employee contracts to balance the 2002-2003 budget. Deseret News, 6/12/03

SkyWest Inc. signed a deal with United Airlines that could more than double the size of its commuter fleet and boost its nationwide work force by 50 percent. The 11-year pact with the nation's second-largest commercial air carrier would increase the St. George-based airline's fleet from the current 110 planes -- including 55 turboprops and a like number of 50-seat regional jets -- to 227 total aircraft. While the exact deadline for completion of the SkyWest expansion is not known, United has committed to providing the commuter airline with 30 new 70-seat jets by mid-2005, said Brad Rich, SkyWest's chief financial officer. Salt Lake Tribune, 6/11/03

The Washington County School Board awarded the bid to a Salt Lake City-based company for construction of the Washington Fields Elementary School, which is scheduled to open for the 2004-05 school year. Bud Mahas Construction bid $4,935,000 for the building contract, said Phil Williams, capital facilities director for the Washington County School District. The opening of Washington Fields Elementary is expected to alleviate growth pressure in the Washington Fields area, where student enrollment has grown at 9.5 percent annually in recent years. The Spectrum, 6/11/03

The "Affordable Housing in Utah Cities" study from the University of Utah's Bureau of Economic and Business Research ranks 52 cities based on the percentage of affordable units built between 1997 and 2002. The report defines an affordable dwelling as one with a monthly rental or mortgage payment that a family earning 80 percent or less of their county's median income would be able to afford without spending more than one-third of their pay on housing. Ivins was listed as one of the most unaffordable communities in Utah. Salt Lake Tribune, 6/7/03

The Spectrum has purchased a production facility in the Fort Pierce Industrial Park. The 28,800-square-foot facility will house an 11-unit Goss Urbanite Press with twice the speed, capacity and color capability of the current printing press, said Scott Porter, the newspaper's production director. Operations are to begin in November. Since 1985, the newspaper has been produced on a more than 40-year-old Goss Community Press located in the St. George Boulevard office. The Spectrum contracted other publications the press could not accommodate to printing facilities in Salt Lake City and Las Vegas. Salt Lake Tribune, 6/7/03

Seven years of planning and coordination has finally paid off with the construction process now begun on the new bridge across the Santa Clara River next to Southgate Golf Course. At this time, the foundation of the bridge has been completed and the bridge deck girders will be placed in June. The contractor on the project is Interstate Rock Products from Hurricane, headed up by Don Stratton. Construction began in January and is on schedule to be completed at the end of the summer. What this $3.5 million project will do is connect Hilton Drive where it intersects Indian Hills Drive and tie Hilton into Dixie Drive near the Tonaquint Park entrance as one main 40 mph roadway. The Spectrum, 5/24/03

The Utah Department of Transportation, in conjunction with St. George City, has studied the intersection of Bluff Street and St. George Boulevard to provide a more efficient way to move traffic through the congested junction. There were three primary alternatives being considered. The first would include a moderate widening of Bluff Street to provide two southbound lanes turning left onto the Boulevard and two southbound lanes moving through the intersection. The second would include restriping the existing pavement to accommodate two southbound left turns onto the Boulevard, with one of those lanes sharing with vehicles going straight through the intersection, along with one exclusive through lane.

The third alternative would include widening Bluff Street substantially that would allow two southbound left turn lanes, two southbound through lanes, a southbound right turn lane, and 3 northbound through lanes. The Spectrum, 5/24/03

In cooperation with UDOT, the Exit 10 reconstruction project in Washington is scheduled to be completed in October. The contractor anticipates completion prior to this date. In cooperation with UDOT, there are two new signals -- one of which is being constructed at the intersection of 700 West and Telegraph streets and the other being constructed at the intersection of SR-9 and Telegraph street. The Spectrum, 5/24/03

Public works projects in Virgin include a new two-lane concrete bridge connecting Highway 9 to Highway 59. The bridge replaces an old, two-lane steel one. Mesa Road has recently been covered in 2,000 feet of new black top surface. Safety concrete barriers were purchased recently and approximately half have been placed on the most dangerous turns. The Spectrum, 5/22/04

The bridge spanning the Virgin River between Hurricane and LaVerkin is a major project at this time. The historic arch bridge was becoming inadequate for vehicular traffic and was dangerous for pedestrians and bicyclists. The Utah Department of Transportation and Hurricane and LaVerkin have been planning for many years to help solve these problems. The project is now well under way. The new bridge will be 50-feet 3-inches wide with two travel lanes, two shoulders and a pedestrian lane. Construction costs on the new bridge and the refurbishing of the existing bridge will be $11.2 million with an original completion date of December 2004. The project is expected to be done before its completion date—possibly by six to nine months. The Spectrum, 5/22/03

April's highest Utah hotel occupancy rates were recorded in the St. George area (74 percent), according to Rocky Mountain Lodging Report figures. Statewide occupancy rates measured 58 percent. Salt Lake Tribune, 5/22/03

Despite continuing uncertainty in the air industry, SkyWest Airlines strengthened its position as a regional airline Monday, announcing it will partner with Continental Air- lines. SkyWest 30-passenger Brasilia turbo-prop aircraft will fly as the Continental Connection out of Continental's Houston hub, Sky West chief operating officer Ron Reber said. Continental Connection will link Houston to Killeen, Texas, beginning July 1 and to Waco on Aug. 1, Continental announced. Additional routes with the nation's seventh-largest airline will be announced later. Salt Lake Tribune, 5/20/03

According to the University of Utah's Bureau of Economic and Business Research, during the first three months of 2003, St. George led Utah cities in approving new dwelling permits with 247 permits issued. Deseret News, 5/10/03

SkyWest Airlines Inc. of St. George reported a 33.1 percent increase in revenue passenger miles (RPMs) for April, while available seat miles increased 30.7 percent compared with the same period last year. The airline generated 299.9 million RPMs for the month, while ASMs increased to 445.7 million. Load factor increased 1.3 points to 67.3 percent, compared to 66.0 percent for the same period last year. Passenger boardings for April totaled 775,130 an 18.0 percent increase over April 2002. Salt Lake Tribune, 5/13/03

A computer lab at Tuacahn High School has been designated as a “smart site” for its updated technology and community accessibility. The smart site will be open to Washington

County residents for self-guided training in such areas as computer basics, data management and desktop publishing. LearnKey, a St. George-based e-learning technology company, will conduct some training at the site. The company is donating its time, software and other materials as a service to the community and a selling point to its clients. The Spectrum, 5/8/03

A proposal has be made to build a new highway called the Southern Corridor which would connect St. George to Hurricane via a multi-lane, divided highway on the eastern side of the county. Deseret News, 5/5/03

Dixie College has announced that the college has allocated enough funding to hire new nursing faculty and establish a bachelor's degree in nursing. The program, which will be the fourth four-year program at Dixie State, will be funded by $75,000 from the state, $100,000 donated by Dixie Regional Medical Center and $40,000 from community donations, plus money saved from recent programs that the college has eliminated. The college will also spend $150,000 to hire nursing faculty. The Spectrum, 5/3/03

A private company has indicated it intends to bring fiber-optic redundancy to the St. George area. The city approved a memorandum of understanding with a company called Interlinx which plans to build a fully redundant fiber-optic network in St. George and surrounding areas. The company plans a center office and data center, which will essentially become the hub for St. George. This proposal would be a major advance in telecommunications capacity for the county. The Spectrum, 5/2/03

The U.S. Census reported that Washington County population grew 5.1 percent from July 2001 to July 2002 making it the fasted growing county in Utah. The Spectrum, 4/24/03

The Village Bank broke ground at 1224 S. River Road on March 28 for what will become its third office location serving eastern Washington County residents. The 4,000-square-foot building was designed by Dennis Patten Architects and will be constructed by Pride Construction Company. Construction should be complete by August. The Village Bank on River Road will include four wide drive-through tellers, an ATM and a full-service financial office with on-site loan officers. It will also be equipped to handle all types of personal and commercial accounts. The Spectrum, 4/22/03

Washington County is among the 100 fastest-growing counties in the nation and was the fastest growing in the state between July 1, 2001, and July 1, 2002, according to U.S. Census Bureau estimates. Washington County ranked 26th among the 100 fastest-growing counties (with 10,000 or more residents) between April 1, 2000, when the decennial census was taken, and July 1, 2002. Washington County's population, which nearly doubled during the 1990s, grew by 5.1 percent in 2001-02. Deseret News, 4/17/03

The Sand Hollow Reservoir has been formally dedicated. The reservoir serves several purposes. It will help regenerate the Navajo sandstone on which the reservoir is built and provide a water storage area with a 20,000-acre-foot drought reserve pool. But it also will be a recreation area. Part of the state parks system, Sand Hollow State Park will be constructed in three phases. The first phase will include an entrance station, pavement, boat ramp, marina area and off-highway vehicle staging area, as well as temporary day-use and camping facilities. Phase two includes development of two campgrounds and four day-use facilities. The main campground will offer 50 full utility campsites with shelters, picnic tables, fire rings and restrooms with showers. Another campground will be located on the south shore. Phase three will offer a group-use acre and an equestrian area that will offer trail access and camping. Phase three also includes development of a concession area. The Spectrum, 4/15/03

The Southwest Center, a five-county government agency that provides services ranging from substance abuse counseling to marriage counseling has officially opened its new building. The $3.5 million, 36,000 square-foot-building combines the functions of five offices that used to be scattered around St. George. The Spectrum, 4/11/03

The LaVerkin City Council has approved a conditional use permit for a new LDS chapel. Construction of the chapel will begin later this year and construction is expected to be completed by July or August of next year. The Spectrum, 4/3/03

The Zion Canyon Transportation System's free shuttle has resumed with its fourth season of operation. Salt Lake Tribune, 3/30/03

The Leeds Planning Commission has recommended approval of a 10-lot subdivision with the condition that the developer get a variance for a cul-de-sac. Salt Lake Tribune, 3/21/03

St. George average price for regular, unleaded gasoline increased 17 cents to $1.76 per gallon during the 30-day period of February 9 to March 11—the largest spike of any place in the state. During the same period, Utah's overall gas price rose 13 cents to $1.69, a 56-cent increase from last year according to AAA's monthly Fuel Gauge Report. The Spectrum, 3/17/03

The Division of Youth Corrections has broken ground for a new juvenile detention center. The new center will solve the over capacity problem of the Washington County Youth Crisis Center. The new center will be constructed adjacent to the existing Purgatory Correctional Facility and will contain 64 beds—with plans to expand to 90 beds. The Spectrum, 3/6/03

Coral Desert Rehabilitation has broken ground on a new $5 million rehabilitation facility to be built south of the new Dixie Regional Center on River Road. The facility is scheduled to open in December and will treat patients of all ages for ailments from car accident injuries to athletic injuries to senior rehabilitation patients. It will include cardiac and neurological rehabilitation, as well as physical therapy, speech therapy and occupational therapy. The Spectrum, 3/4/03

The Legislature's $7.3 billion budget includes $400,000 to preserve more than 400 fossilized dinosaur tracks near the Virgin River in St. George. Officials said the money would help fund a museum to protect the fragile sandstone footprints. The Spectrum, 3/4/03

The Leeds Special Service District recently received a U.S. Department of Agriculture Rural Development Community Facilities loan for $100,000 and a grant for $50,000 for a new fire truck and related equipment. The Spectrum, 2/27/03

According to the Rocky Mountain Lodging Report, St. George was one of only two cities in Utah reporting a hotel/motel occupancy rate of greater than 50 percent (53.2 percent) in January. The Salt Lake Tribune, 2/25/03

Green Design Build, LLC, a residential and commercial design and build firm, has opened an office in St. George. The Spectrum, 2/23/03

Ground has been broken for the Sunset shopping center on Sunset Boulevard. Major tenants will include Alberstons, Hollywood Video, Great Clips, Subway and Baskin Robbins. The shopping mall will also include a pizza parlor and Chinese restaurant. The Spectrum, 2/18/03

In a recently passed bill, Congress approved $250,000 for water system improvements in St. George. Deseret News, 2/14/03

Dixie Regional Medical Center has added a new cancer treatment facility. Formerly, most St. George patients went to Salt Lake City for this type of treatment. The Salt Lake Tribune, 2/14/03

The 13th St. George Area Parade of Homes brought many out-of-town visitors to the St. George area in February. The economic impact of the Parade to the community is estimated at $32 million. The Spectrum, 2/14/03

Ivins will begin advertising for bid on a $50,000 project to repair the rough road along 400 East. The Spectrum, 2/7/03

Sunbrook Communities, a master-planned community in St. George hosted a public grand-opening at its Discovery Center. The Salt Lake Tribune, 2/6/03

Dixie State College has registered record growth in spring enrollment. The number of full-time equivalent students registered for spring semester is up 10 percent from a year ago. The Spectrum, 1/27/03

The Paradise Bowl drew many outsiders to the St. George Area. Promoters estimate that 3,000 out of the 4,500 fans came from outside the area. The Spectrum, 1/26/03

The Washington County School Board has approved a construction timeline for the Washington Fields Elementary School. The $4.9 million project is scheduled to be open for bid in April and be completed in the 2004-2005 school year. The Spectrum, 1/15/03

The Utah State Parks and Recreation Board has approved the first phase of a recreational development at Sand Hollow Reservoir (which is currently filling), northeast of St. George. Initial development will include a park entrance, boat ramp and campground. Salt Lake Tribune, 1/15/03

Zion National Park saw an increase in visitors every month in 2002 with the exception of January and August. The number of tourists climbed to roughly 2,614,700—the highest levels in 10 years.

The St. George City Council has approved a taxing structure that it hopes will aid in energizing the downtown. The developers of the Mainstreet Plaza will not pay property taxes for the first three years of the life of the building and its accompanying parking structure. The council also approved spending $1.2 million for the city's portion of the Mainstreet Plaza parking structure. The Spectrum, 1/10/03

Several companies announced expansion at the Washington County Economic Summit. Deseret Laboratories is projecting an 18 percent increase in sales for fiscal 2003 and plans to create approximately 20 new Washington County jobs. Pace American also announce plans to add another 20 to 30 employees this year. The Spectrum, 1/9/03

Ground has been broken at the new Tonaquint industrial park for the future headquarters of Steton Technologies Group. The company expects to employ more than 30 workers once the facility is completed in May. Salt Lake Tribune, 01/09/03

The WalMart portion of the Red Cliffs Mall has been purchased by the owner of the mall General Growth Properties. The company is considering several retail opportunities for the space. The Spectrum, 01/04/03

The Hurricane City Council has voted to raise water rates and impact fees. It also voted to start assessing impact fees for new hangers at the Hurricane airport. The Washington County Water Conservancy District has put in an order for $5.4 million worth of pipe and fittings to provide customers with drinking water from the Quail Point Water Treatment Plant. Salt Lake Tribune, 12/24/02

Hurricane is moving forward on a fire station for the city's growing west side. Architectural proposals have been received for a 4,500 to 5,200 square-foot building at 450 N 3400 W. Cost is estimated at $430,000, a portion of which will be paid by a Community Development Block Grant. Salt Lake Tribune, 12/19/02

Developers will begin work on the Main Street Plaza in St. George in January. The 90,000-square-foot complex will have about 70,000 square feet of space available for lease. A Blue Bunny Ice Cream parlor and several other companies have already signed leases. The Spectrum 12/19/02

Hurricane is planning to build a new fire station that will include apparatus bays, office areas, a bunk area and a kitchen/dining area. The station is expected to cost $430,000. The Spectrum, 12/10/02

St. George-based SkyWest expects to escape most of the turbulence of United Airlines' bankruptcy filing. SkyWest receives a fixed fee for every United Express flight regardless of how many passengers it carries. Salt Lake Tribune, 12/10/02

Dixie College has broken ground for its new $19-million fine arts building. The 70,000 square-foot building will be the largest on campus. Completion of construction is expected for January 2004. Deseret News, 12/01/02

The OMG Apex chemical plant will close January 6, 2003 leaving 63 employees jobless. The company is shutting down the cobalt and tungsten production lines to cut corporate costs. Salt Lake Tribune, 11/30/02

Entrada at Snow Canyon was listed among Zagat Survey/ESPN list of best golf courses in the six-state Rocky Mountain region (Utah, Colorado, Montana, Idaho, Nevada, Wyoming), and cited for its scenic qualities and being "Junior Friendly." Coral Canyon made the "Women Friendly" list. Deseret News, 11/29/02

St. George hotels and motels had a 74.8 percent occupancy rate during October 2002 according to the Rocky Mountain Lodging Report. State occupancy rates measured only 58.7 percent. Salt Lake Tribune, 11/26/02

The federal government soon will release $500,000 to St. George so the city can preserve an extraordinary source of dinosaur tracks. The Spectrum, 11/21/02

Majestic View Lodge was approved by the Springdale Town Council to build three buildings with 20 rooms in each. The council also gave approval for the company to put in a building with 13 hotels rooms across the street at the former Eagles Nest. Zion Canyon Campground was approved to build three units of 18 rooms each. Only two will be constructed this year, with the third building to built in another year. The Spectrum, 11/18/02
Dixie State College announced the general contractor for the $18 million Eccles/Graff Fine and Performing Arts Center which has recently received $14.5 million from the Legislature. Layton Construction is expected to finish the 78,000 square-foot center by January 2004. The Spectrum, 11/07/02

St. George may soon be home to a campus of the University of Phoenix—a private, for-profit higher education institution that provides Bachelor's and Master's degrees to working adult students. The Spectrum, 11/05/02

A 100,000-square-foot plastic injection facility will be the next addition to the Fort Pierce Industrial Park in St. George. Bomatic Inc., plans on beginning construction of the plant in December or January. The new facility could create about 100 new jobs. The Spectrum, 10/31/02

The Washington County School Board has leased the Phelps Elementary School in Hildale to a group of investors who plan to open a private school on the site. The school was closed when members of the Fundamentalist Church of Jesus Christ pulled their children out of the school. Salt Lake Tribune, 10/27/02

The National Park Service has approved a project for PacifiCorp to upgrade power lines in and around Zion National Park. The lines have been a source on controversy since new poles will be 20 feet higher than the old ones. Salt Lake Tribune, 10/27/02

The Washington County Commission voted Tuesday to approve a zone change that will allow for the creation of the Copper Rock Golf Course and Development in the Hurricane area. It will be a 1,600-unit development on 900 acres of ground located adjacent to the existing Grassy Meadows Sky Ranch Subdivision in Hurricane. The Spectrum, 10/16/02

Rural Utah counties preparing budgets for next year may face cutbacks in federal PILT funds. Since 1977, the federal government has provided "payment in lieu of taxes" funds to counties with large tracts of nontaxable federal land. The federal budget for 2003 has yet to be approved, and President Bush wants to cut PILT money by 23.5 percent. Utah is fifth in the nation in PILT funding, behind California. In 2002, Utah received more than $16 million. Last year Washington Count received $1.3 million. Deseret News, 10/15/02

After a two-day evaluation, Dixie State College is one step closer to gaining accreditation at the baccalaureate level. A team representing the Northwest Association of Schools and Colleges conducted an intensive review of the college. The complete report and a recommendation on accreditation will be turned over to the college and Commission on Colleges and Universities for review in December. In early January 2003, the college will be notified of the commission's action. Deseret News, 10/12/02

The number on single-family housing units sold in Washington County during third quarter 2002 was up more than 200 percent over the same figure a year ago. The average home price rose from $143,091 in third quarter 2001 to $145,668 in third quarter 2002. Deseret News, 10/11/02

The St. George City Council has decided to participate in a massive power project that involves communities in Utah and Arizona. The plant will be built in Payson. St. George will contribute $10 million to the project over the next 20 years. The cost of power to come from the future plant is estimated to be $5 per megawatt hour. The average price of power to the city of St. George in midsummer 2001 was more than $37 per megawatt hour. The Spectrum, 9/27/02

The Virgin Town Council gave approval to Liahona Academy, residential youth facility to build a home in the town that will house up to 48 boys. The Spectrum, 9/20/02

Utah ranchers, hit hard by drought, will soon receive millions of dollars in immediate federal aid. The U.S. Department of Agriculture announced it would release $752 million in cash to relieve drought-stricken livestock in 37 states. Utah is one of seven states that has declared a statewide drought disaster, and therefore, will qualify for a large share of the money. Salt Lake Tribune, 09/20/02

In response to a recent court ruling, the Federal Aviation Administration issued an order that St. George must conduct a comprehensive environmental study concerning the new airport's possible effect on the natural quiet of Zion National Park. The project, originally scheduled for completion in 2008, will probably be delayed one to two years. Salt Lake Tribune, 9/11/02

The St. George City Council decided to match $130,000 in federal funds to keep Dixie Area Rapid Transit System (DARTS) service running. However, starting in January, the city will cut back service. Deseret News, 9/08/02

St. George-based SkyWest Airlines in one of only a few air carriers to generate a steady profit since terrorists crashed jetliners into the World Trade Center and the Pentagon on September 11, 2001. Over the past 12 months, the airline has increased its fleet by 31 planes, expanded its route system to 10 additional cities and hired more than 700 new employees. Salt Lake Tribune, 9/08/02

A $500,000 dental clinic will soon begin serving Dixie State College's dental hygiene program and offer the community checkup and cleaning for minimal fees. Salt Lake Tribune, 8/24/02

Privately held Deseret Laboratories International and California-based AutoImmune Inc., have formed Colloral LLC, a joint venture that will manufacture, market and sell Colloral, a product for nutritional support of patients with rheumatoid arthritis. Deseret News, 8/20/02

The Learning Center for Families has received a $515,835 grant from the Administration for Children and Families to provide Early Head Start services to low income pregnant women and families of children birth to three.

Work has been completed on the new $3.1 million, 33,800-square-foot Washington County School District headquarters in St. George. The Spectrum, 8/14/02

Las Vegas-based slot machine manufacturer, Mikohn Gaming Corp plans to layoff about 100 employees across the country and move its remaining Las Vegas manufacturing operations to Hurricane. The Spectrum, 8/9/02

Workers are installing the second roundabout intersection in St. George, this one at Tabernacle and Main. At $230,000 the roundabout will cost tree times that of a traffic light installation. Salt Lake Tribune, 8/5/02
Work has begun on a new bridge which will span the 400-foot-wide Virgin River gorge 10 miles southwest of Zion National Park on State Route 9. The old bridge will be retrofitted and widened when the new bridge is completed. In 2004, the upgraded bridge will handle southbound traffic while the new one will take northbound vehicles. Together, the dual bridge project will cost $11.2 million. Salt Lake Tribune, 8/4/02

Critical Facilities of Washington County

A listing of the Critical Facilities of Washington County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 62 below:

Table 62 Critical Facilities of Washington County

Name or Description of Asset Enterprise City	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Enterprise Clinic	Enterprise City	X					5,300 sq. ft.	$350,000	
Enterprise High School	Enterprise City	X					97,700 sq. ft.	$9,066,560	
Enterprise Elementary School	Enterprise City	X	X				47,250 sq. ft.	$4,262,895	
Enterprise Fire Station	Enterprise City	X					4,000 sq. ft.	$220,000	
Enterprise City Office/Town Hall	Enterprise City	X					4,000 sq. ft.	$220,000	
Enterprise 4 Water Tanks	Enterprise City	X					1.4MG	$970,000	
Enterprise Sewer Lagoons	Enterprise City	X			X		2 lagoons 124 acre ft.	$750,000	

Name or Description of Asset **Hildale Town**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Hildale Clinic		X					not avail.	$unknown	
Hildale Fire Station		X					not avail.	$unknown	
Hildale Police Station		X					not avail.	$unknown	
Elementary School		X	X				not avail.	$unknown	
Hildale Town Hall		X					not avail.	$unknown	
Hildale Community Center		X					not avail.	$unknown	
Water Tank		X					not avail.	$ unknown	
Water Tank		X					not avail.	$ unknown	
Water Tank		X					not avail.	$ unknown	
Water Tank		X					not avail.	$ unknown	
Sewer Lagoon		X			X		not avail.	$ unknown	

Name or Description of Asset **Hurricane City**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Hurricane Fire Station #1	Hurricane City	X					7,500 sq. ft.	$650,000	Earthquake Fault
Hurricane Police Station	Hurricane City	X					3,500 sq. ft.	$240,780	Earthquake Fault
Hurricane Medical Clinic	Hurricane City	X					6,500 sq. ft.	$750,000	
Hurricane Middle School	Washington County School District	X					100,109 sq. ft.	$9,531,377	
Hurricane High School	Washington County School District	X					161,409 sq. ft.	$14,978,755	
Hurricane City Offices	Hurricane City	X					9,750 sq. ft.	$850,000	
Hurricane Airport	Hurricane City	X		X				$1,500,000	Earthquake Fault
Water Tank	Hurricane City	X					2MG	$750,000	Earthquake Fault
Water Tank	Hurricane City	X					1MG	$350,000	Earthquake Fault
Water Tank	Hurricane City	X					1MG	$350,000	
Ash Creek SSD Sewer Lagoons	Ash Creek SSD	X			X		1MG treated daily	$5,000,000	

Name or Description of Asset **Ivins City**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Ivins City Office Building	Ivins City	X					7,000 sq. ft.	$591,500	
Ivins City Fire Station	Ivins City	X					9,900 sq. ft.	$548,000	Flood
Water Tank	Ivins City	X					2.0MG	$347,000	Flood
Water Tank	Ivins City	X					1.0MG	$247,000	unknown
Water Tank	Ivins City	X					0.4MG	$200,000	unknown
Water Tank	Ivins City	X					0.5MG	$268,000	unknown
City Yard Building/ Animal Control	Ivins City	X					1,716 sq. ft.	$188,200	
Red Mountain Elementary School	Washington County School District	X	X				49,470 sq. ft.	$4,463,183	

Name or Description of Asset **LaVerkin City**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
La Verkin Town Hall	LaVerkin City	X				X	13,367 sq. ft.	$1,327,000	Earthquake Fault
La Verkin Fire Station	LaVerkin City	X					3,200 sq. ft.	$281,500	Earthquake Fault
Water Tank	LaVerkin City	X					1.5MG	$387,000	Earthquake Fault
Water Tank	LaVerkin City	X					1.0MG	$600,000	Earthquake Fault
La Verkin Community Center	LaVerkin City	X					1,800 sq. ft.	$119,900	Earthquake Fault
La Verkin Elementary	Washington County School District	X					45,724 sq. ft.	$4,125,219	Earthquake Fault

Name or Description of Asset Leeds Town	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Leeds Area SSD Fire/Rescue Station	Leeds Town	X					not avail.	$unknown	Wildfire
Water Tank	Leeds Town	X					not avail.	$unknown	Wildfire
Water Tank	Leeds Town	X					not avail.	$unknown	
Water Tank	Leeds Town	X					not avail.	$unknown	
Water Tank	Leeds Town	X					not avail.	$unknown	
Cellular Tower	Privately Owned	X					not avail.	$unknown	Wildfire

Name or Description of Asset **New Harmony Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
New Harmony Fire Station	New Harmony	X					not avail.	$unknown	
New Harmony Town Hall/Community Center	New Harmony	X					not avail.	$unknown	
Water Tank	New Harmony	X					not avail.	$unknown	

Name or Description of Asset **Rockville Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Rockville Community Center	Rockville Town	X				X	7,659 sq. ft.	$550,800	
Iron Bridge across Virgin River	Rockville Town	X				X	not avail.	$unknown	Floodplain
Water Tank	Private Stockholder Company	X					0.4MG	$800,000	

Name or Description of Asset Santa Clara City	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Santa Clara Fire Station	Santa Clara City	X					2,123 sq. ft.	$362,890	
Santa Clara Heights Area Fire Station	Santa Clara City	X					6,148 sq. ft.	$410,730	Floodplain
Santa Clara Elementary School	Washington County School District	X	X				45,065 sq. ft.	$4,065,764	
Lava Ridge Intermediate School	Washington County School District	X					126,615 sq. ft.	$12,055,014	Floodplain
Santa Clara Public Works Facility	Santa Clara City	X					3,800 sq. ft.	$179,100	
Water Tank #1	Santa Clara City	X					0.4MG	$329,990	
Water Tank #2	Santa Clara City	X					2MG	$748,320	
Santa Clara City Office	Santa Clara City	X					2,881 sq. ft.	$223,820	

Name or Description of Asset St. George City	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
St. George City Office Building	St. George City	X					33,096 sq. ft.	$3,650,560	
St. George Police Station	St. George City	X					18,900 sq. ft.	$2,500,000	
St. George Fire Station #1	St. George City	X					4,000 sq. ft.	$393,750	
St. George Fire Station #2	St. George City	X					6,500 sq. ft.	$164,850	
St. George Fire Station #3	St. George City	X					2,435 sq. ft.	$168,000	
St. George Fire Station #4	St. George City	X					2,700 sq. ft.	$183,750	
St. George Fire Station #5	St. George City	X					2,435 sq. ft.	$168,000	
St. George Fire Station #6	St. George City	X					5,000 sq. ft.	$400,000	
St. George Fire Station #7	St. George City	X					10,000 sq. ft.	$1,000,000	
Quail Lake Water Treatment Facility	St. George City	X					Complete Facility	$30,000,000	
Wastewater Treatment Plant	St. George City	X			X		Complete Facility	$16,800,000	
Bloomington Hills Area Water Tank	St. George City	X					5MG	$800,000	
T-Bone Water Tank	St. George City	X					3MG	$690,000	
Gunlock Water Tank	St. George City	X					3MG	$690,000	
Concrete Water Tank	St. George City	X					1MG	$350,000	
Stone Cliff Water Tank	St. George City	X					0.3MG	$90,000	

Bloomington Hills So. Water Tank	St. George City	X					2.25MG	$585,000	
Green Water Tank	St. George City	X					1.7MG	$442,000	
Main Street Water Tank	St. George City	X					2MG	$520,000	
Industrial Water Tank	St. George City	X					2MG	$520,000	
Snow Canyon So. Water Tank	St. George City	X					3MG	$2,100,000	
Snow Canyon No. Water Tank	St. George City	X					3MG	$2,100,000	
St. George Municipal Airport	St. George City	X		X			Terminal only	$1,050,500	
Dixie Regional Medical Center	IHC Hospitals	X					400,000 sq. ft.	$100,000,000	
Dixie High School	Washington County School District	X					173,688 sq. ft.	$16,118,246	
Dixie Middle School	Washington County School District	X					116,387 sq. ft.	$11,081,206	
Pine View High School	Washington County School District	X					190,166 sq. ft.	$17,647,404	
Pine View Middle School	Washington County School District	X					120,000 sq. ft.	$11,425,200	
Snow Canyon High School	Washington County School District	X					242,105 sq. ft.	$22,467,344	
Snow Canyon Middle School	Washington County School District	X					134,109 sq. ft.	$12,768,517	

Name or Description of Asset **Virgin Town**	**Sources Of Information**	**Critical Facility**	**Vulnerable Populations**	**Economic Assets**	**Special Considerations**	**Historic/Other Considerations**	**Size of Building (sq. ft.)**	**Replacement Value (Estimated)**	**Located in Hazard Area**
Springdale City Office		X					unknown	$unknown	
Springdale Elementary School	Washington County School District	X	X				6,566 sq. ft.	$592,384	
Springdale Fire Station		X					unknown	$unknown	

Name or Description of Asset **Toquerville Town**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Toquerville Town Hall	Toquerville City	X				X	4,000 sq. ft.	$100,000	Landslide, Earthquake Fault
Concrete Water Tank	Toquerville City	X					0.25MG	$375,000	Landslide, Earthquake Fault
Steel Water Tank	Toquerville City	X					0.475MG	$400,000	
Steel Water Tank	Toquerville City	X					0.1MG	$100,000	

Name or Description of Asset **Virgin Town**	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Virgin Town Hall	Virgin Town	X				X	3,000 sq. ft.	$unknown	
Concrete Water Tank	Virgin Town	X					0.2MG	$unknown	
Steel Water Tank	Virgin Town	X					0.5MG	$unknown	

Name or Description of Asset Washington City	Sources Of Information	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value (Estimated)	Located in Hazard Area
Washington City Office Building	Washington City	X					18,947 sq. ft.	$2,012,100	
Washington City Fire Station #61	Washington City	X					6,800 sq. ft.	$800,000	
Washington City Fire Station #62	Washington City	X					4,870 sq. ft.	$650,000	
Water Treatment Plant (SR9 & Telegraph Street)	Washington City	X					7,200 sq. ft. (bldg.)	$3,000,000	
Warner Valley Water Tank	Washington City	X					1MG	$600,000	
Grape Vine Pass Water Tank	Washington City	X					1MG	$600,000	
Red Cliffs Water Tank#1	Washington City	X					1MG	$600,000	
Red Cliffs Water Tank #2	Washington City	X					2.3MG	$750,000	
Sewer Lift Station at Grapevine Wash & Telegraph Street)	Washington City	X			X		300 sq. ft.	$80,000	

Analysis of Infrastructure of Washington County

A listing of the Infrastructure of Washington County, and whether or not they are located within a Hazard area, along with an estimated cost for replacement of those facilities is shown in Table 63

Table 63 Critical Infrastructure of Washington County

Name of Town **St George**	**County Total**	**Town Total**	**Unincorporated Total**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	16	3	10	0	0	0	0	1	0	1	0	1	0	0
# of Highway Bridges	109	37	31	18	140	0	0	4	60	0	0	13	0	200
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	23.37	117.08	3.95	15.8	0	0	4.69	19	3.91	16	5.59	0	50.8
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	2.51	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	5.95	139.54	.19	.010	.10	.005	0	0	.79	.040	2.33	.117	.172
HAZARDS														
Flood Zones (sq miles)	40.47	9.72	15.26											
Land Slides (sq miles)	132.68	.69	126.82											
Problem Soils (sq miles)	361.33	23.60	302.21											
Volcanic Flows (sq miles)	224.20	2.38	196.74											
Wildfires (sq miles)	1274.35	33.10	1161.7											

Name of Town Enterprise	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	0	31	0	0	0	0	0	0	1	5	0	0	5
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	1.73	117.08	0	0	0	0	0	0	0	0	.27	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	0	139.54	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	40.47	0	15.26											
Land Slides (sq miles)	132.68	0	126.82											
Problem Soils (sq miles)	361.33	0	302.21											
Volcanic Flows (sq miles)	224.20	.14	196.74											
Wildfires (sq miles)	1274.35	.76	1161.7											

Name of Town **Hilldale**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	0	31	0	0	0	0	0	0	0	0	0	0	0
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	1.25	117.08	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	1.56	139.54	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	40.47	.02	15.26											
Land Slides (sq miles)	132.68	.06	126.82											
Problem Soils (sq miles)	361.33	0	302.21											
Volcanic Flows (sq miles)	224.20	00	196.74											
Wildfires (sq miles)	1274.35	.24	1161.7											

Name of Town Hurricane	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	2	10	0	0	0	0	1	0	0	0	1	0	0
# of Highway Bridges	109	7	31	1	5	0	0	1	5	0	0	2	0	10
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	15.07	117.08	.90	3.6	0	0	1.72	7	4.54	18	10	0	28.6
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	7.09	99.55	.26	.013	0	0	1.86	.093	6.63	.332	6.91	.346	.784
Other Utility Lines (miles)	169.86	10.25	139.54	.68	.034	.04	.002	2.48	.12	5.83	.29	7.68	.384	.830
HAZARDS														
Flood Zones (sq miles)	40.47	1.34	15.26											
Land Slides (sq miles)	132.68	.14	126.82											
Problem Soils (sq miles)	361.33	4.43	302.21											
Volcanic Flows (sq miles)	224.20	.96	196.74											
Wildfires (sq miles)	1274.35	24.02	1161.7											

Name of Town Ivins	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	1	10	1	0	0	0	0	0	0	0	1	0	0
# of Highway Bridges	109	0	31	0	0	0	0	0	0	0	0	0	0	0
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	4.86	117.08	1.61	6.44	0	0	0	0	0	0	1.59	0	6.44
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	0	139.54	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	40.47	4.30	15.26											
Land Slides (sq miles)	132.68	.01	126.82											
Problem Soils (sq miles)	361.33	.88	302.21											
Volcanic Flows (sq miles)	224.20	1.0	196.74											
Wildfires (sq miles)	1274.35	5.61	1161.7											

Name of Town LaVerkin	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	3	31	1	5	0	0	0	0	0	0	2	0	5
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	6.24	117.08	.21	.84	0	0	0	0	0	0	2.36	0	.84
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	4.89	99.55	2.15	.125	0	0	0	0	0	0	.99	.050	.175
Other Utility Lines (miles)	169.86	1.29	139.54	0	0	0	0	.12	.006	0	0	.07	.0004	.0064
HAZARDS														
Flood Zones (sq miles)	40.47	.90	15.26											
Land Slides (sq miles)	132.68	.86	126.82											
Problem Soils (sq miles)	361.33	2.19	302.21											
Volcanic Flows (sq miles)	224.20	00	196.74											
Wildfires (sq miles)	1274.35	2.33	1161.7											

Name of Town Leeds	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	6	31	0	0	0	0	0	0	0	0	4	0	0
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	2.32	117.08	.68	2.72	0	0	0	0	0	0	1.20	0	2.72
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	0	139.54	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	40.47	.23	15.26											
Land Slides (sq miles)	132.68	0	126.82											
Problem Soils (sq miles)	361.33	.31	302.21											
Volcanic Flows (sq miles)	224.20	00	196.74											
Wildfires (sq miles)	1274.35	2.01	1161.7											

Name of Town **New Harmony**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	1	31	0	0	0	0	0	0	0	0	0	0	0
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	.82	117.08	0	0	0	0	0	0	0	0	0	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	0	139.54	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	40.47	.01	15.26											
Land Slides (sq miles)	132.68	0	126.82											
Problem Soils (sq miles)	361.33	0	302.21											
Volcanic Flows (sq miles)	224.20	00	196.74											
Wildfires (sq miles)	1274.35	.04	1161.7											

Name of Town Rockville	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	2	31	1	0	0	0	0	0	0	0	0	0	5
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	3.63	117.08	1.04	4.16	0	0	0	0	0	0	0	0	4.16
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	3.58	139.54	1.26	63k	0	0	1.44	72k	0	0	0	0	.135
HAZARDS														
Flood Zones (sq miles)	40.47	2	15.26											
Land Slides (sq miles)	132.68	1.37	126.82											
Problem Soils (sq miles)	361.33	5.39	302.21											
Volcanic Flows (sq miles)	224.20	00	196.74											
Wildfires (sq miles)	1274.35	1.32	1161.7											

Name of Town Santa Clara	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	0	31	0	0	0	0	0	0	0	0	0	0	0
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	2.44	117.08	.25	1	0	0	0	0	0	0	.27	0	1.04
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	0	139.54	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	40.47	1.01	15.26											
Land Slides (sq miles)	132.68	.01	126.82											
Problem Soils (sq miles)	361.33	3.14	302.21											
Volcanic Flows (sq miles)	224.20	.14	196.74											
Wildfires (sq miles)	1274.35	3.37	1161.7											

Name of Town Springdale	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	1	31	0	0	0	0	0	0	0	0	0	0	0
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	3.72	117.08	1.28	5.12	0	0	1.90	8	0	0	0	0	13.12
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	.63	139.54	0	0	0	0	.63	32k	0	0	0	0	32k
HAZARDS														
Flood Zones (sq miles)	40.47	1.10	15.26											
Land Slides (sq miles)	132.68	1.80	126.82											
Problem Soils (sq miles)	361.33	2.41	302.21											
Volcanic Flows (sq miles)	224.20	00	196.74											
Wildfires (sq miles)	1274.35	.96	1161.7											

Name of Town **Toquerville**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	0	0	0
# of Highway Bridges	109	6	31	1	5	0	0	0	0	2	20	4	0	25
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	7.71	117.08	.20	.80	0	0	0	0	3.77	15	4.86	0	15.84
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	0	99.55	0	0	0	0	0	0	0	0	0	0	0
Other Utility Lines (miles)	169.86	0	139.54	0	0	0	0	0	0	0	0	0	0	0
HAZARDS														
Flood Zones (sq miles)	40.47	.94	15.26											
Land Slides (sq miles)	132.68	0	126.82											
Problem Soils (sq miles)	361.33	0	302.21											
Volcanic Flows (sq miles)	224.20	.07	196.74											
Wildfires (sq miles)	1274.35	11.90	1161.7											

Name of Town Virgin	County Total	Town	Unincorporated	Flood Zone Town	Flood Zone Costs in Millions $	Land Slide Town	Land Slide Costs in Millions $	Problem Soil Town	Problem Soil Costs in Millions $	Volcanic Flow Town	Volcanic Flow Costs in Millions $	Wildfire Town	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards
# of Dams (High Hazard)	16	0	10	0	0	0	0	1	0	0	0	0	0	0
# of Highway Bridges	109	2	31	2	10	0	0	2	10	0	0	0	0	20
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	5.07	117.08	.75	3	0	0	3.58	14	0	0	0	0	17
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	7.07	99.55	0	0	0	0	10.9	.55	0	0	1.5	.075	.625
Other Utility Lines (miles)	169.86	4.31	139.54	.39	20k	0	0	3.81	.19	0	0	.53	.027	.237
HAZARDS														
Flood Zones (sq miles)	40.47	.88	15.26											
Land Slides (sq miles)	132.68	.29	126.82											
Problem Soils (sq miles)	361.33	14.04	302.21											
Volcanic Flows (sq miles)	224.20	.40	196.74											
Wildfires (sq miles)	1274.35	5.48	1161.7											

Name of Town **Washington**	**County Total**	**Town**	**Unincorporated**	**Flood Zone Town**	**Flood Zone Costs in Millions $**	**Land Slide Town**	**Land Slide Costs in Millions $**	**Problem Soil Town**	**Problem Soil Costs in Millions $**	**Volcanic Flow Town**	**Volcanic Flow Costs in Millions $**	**Wildfire Town**	**Wildfire Costs in Millions $**	**Total Cost in millions $ for all Hazards**
# of Dams (High Hazard)	16	0	10	0	0	0	0	0	0	0	0	2	0	0
# of Highway Bridges	109	13	31	1	5	0	0	0	0	0	0	6	0	5
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	5.15	117.08	0	0	0	0	0	0	0	0	.19	0	0
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	8.72	99.55	0	0	.40	.020	0	0	1.28	.064	3.86	.193	.277
Other Utility Lines (miles)	169.86	2.74	139.54	0	0	0	0	0	0	.45	.023	2.46	.123	.146
HAZARDS														
Flood Zones (sq miles)	40.47	3.86	15.26											
Land Slides (sq miles)	132.68	.64	126.82											
Problem Soils (sq miles)	361.33	2.61	302.21											
Volcanic Flows (sq miles)	224.20	.02	196.74											
Wildfires (sq miles)	1274.35	21.40	1161.7											

Unincorporated Area of County	County Total	Towns Total	Unincorporated Total	Flood Zone Unincorporated	Flood Zone Costs in Millions $	Land Slide Unincorporated	Land Slide Costs in Millions $	Problem Soil Unincorporated	Problem Soil Costs in Millions $	Volcanic Flow Unincorporated	Volcanic Flow Costs in Millions of $	Wildfire Unincorporated	Wildfire Costs in Millions $	Total Cost in millions $ for all Hazards in Unincorporated
# of Dams (High Hazard)	16	6	10	0	0	1	0	1	0	2	0	7	0	0
# of Highway Bridges	109	78	31	4	40	4	60	4	50	7	65	22	0	215
# Tunnels	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Major Roads (miles)	200.46	83.38	117.08	8.78	35.1	6.84	27	16.1	64	16.2	65	53.3	0	191.4
Railways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Lines (miles)	127.32	27.77	99.55	1.14	.056	8.33	.42	10.1	.51	18.9	.95	71.5	.286	2.222
Other Utility Lines (miles)	169.86	30.32	139.54	2.77	.139	.61	.031	19.9	1	19.2	.96	57.6	2.88	5.010
HAZARDS														
Flood Zones (sq miles)	40.47	25.21	15.26											
Land Slides (sq miles)	132.68	5.86	126.82											
Problem Soils (sq miles)	361.33	59.12	302.21											
Volcanic Flows (sq miles)	224.20	27.46	196.74											
Wildfires (sq miles)	1274.35	112.63	1161.7											

Wildfire

FEMA Hazard Profile

Frequency: Likely (drought patterns are cyclical)
Severity: Negligible to structures in most incorporated communities with the exception of structures in the town of Leeds and in unincorporated Washington County located in a Moderate to High wildfire risk area.
Duration: Containment time varies for each fire.

Assessing Vulnerability

Overall Summary of Impacts

Wildfires occur every year in the United States. Factors that influence the potential for wildfires include: type, amounts and conditions of fuel supply (vegetation); temperatures; wind conditions; precipitation patterns; humidity levels; topography and the levels of human activity on the land. Fires in areas of heavy vegetation, if not quickly detected and suppressed can quickly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property.

Most rural wildfires result from thunderstorm activity. In addition, other wildfires are started by acts of human carelessness during activities such as controlled burns of forest areas; burning of ditch banks and fields by landowners; recreational activity such as camping, hunting, and other off-road vehicle travel; and use of both legal and illegal fireworks.

The Five County Association of Governments GIS, utilizing available data, has identified residential and commercial structures at moderate or high risk from wildfire. See Table 64 below for an analysis of wildfire risk in Washington County.

In unincorporated Washington County there are 233 residential structures at moderate risk from wildfire. This is 7.70% of the homes in unincorporated Washington County. Based upon figures provided by the Washington County Assessors Office, the market value of those structures is estimated to be $24,892,388. Based upon the average household size of 2.97 persons, in Washington County, from the 2000 U.S. Census, there are approximately 692 persons residing full or part time in a residential structure at moderate risk from wildfire. This is 22.89% of the 3,023 population of unincorporated Washington County. There are also 64 residential structures at high risk from wildfire. Based upon figures provided by the Washington County Assessors Office, the market value of those structures is estimated to be $6,822,287. Based upon the average household size of 2.97 persons, in Washington County, from the 2000 U.S. Census, there are approximately 190 persons residing full or part time in a residential structure at high risk from wildfire. This is 6.28% of the 3,023 population of unincorporated Washington County. There are no commercial structures in unincorporated Washington County identified to be in a moderate, high or extreme wildfire risk area.

In Enterprise City there are approximately 8 homes at moderate risk from wildfire. These account for 1.84% of the 434 residential structures in Enterprise City. The value of the structures at risk is estimated to be $615,717. Based upon the average household size in Enterprise City of 3.40 persons, there are approximately 27 persons at moderate risk from wildfire. This is 2.10% of the 1,285 population of Enterprise City. There are 2 homes at high risk from wildfire. These account for 0.46% of the 434 residential structures in Enterprise City. The value of the structures at risk is estimated to be $153,930. Based upon the average household size in Enterprise City of 3.40 persons, there are approximately 7 persons at high risk from wildfire. This is 0.54% of the 1,285 population of Enterprise City.

In Hurricane City there are approximately 176 homes at moderate risk from wildfire. These account for 5.88% of the 2,991 residential structures in Hurricane City. The value of the structures at risk is estimated to be $16,663,587. Based upon the average household size in Hurricane City of 2.97 persons, there are approximately 523 persons at moderate risk from wildfire. This is 6.33% of the 8,250 population of Hurricane City. There are approximately 74 homes at high risk from wildfire. These account for 2.47% of the 2,991 residential structures in Hurricane City. The value of the structures at risk is estimated to be $6,982,470. Based upon the average household size in Hurricane City of 2.97 persons, there are approximately 219 persons at high risk from wildfire. This is 2.65% % of the 8,250 population of Hurricane City. There are 58 businesses at moderate risk from wildfire in Hurricane City. This is 26.24% of the commercial structures in Hurricane City. The value of those structures is estimated at $18,789,255. There are 86 businesses at high risk from wildfire in Hurricane City. This is 38.91% of the commercial structures in Hurricane City. The value of those structures is estimated at $27,853,937.

In Ivins City there are approximately 34 homes at moderate risk from wildfire. These account for 1.61% of the 2,103 residential structures in Ivins City. The value of the structures at risk is estimated to be $4,045,841. Based upon the average household size in Ivins City of 3.10 persons, there are approximately 105 persons at moderate risk from wildfire. This is 2.35% of the 4,450 population of Ivins City. There are approximately 141 homes at high risk from wildfire. These account for 6.70% of the 2,103 residential structures in Ivins City. The value of the structures at risk is estimated to be $16,774,724. Based upon the average household size in Ivins City of 3.10 persons, there are approximately 437 persons at high risk from wildfire. This is 9.82% % of the 4,450 population of Ivins City. There are 7 businesses at moderate risk from wildfire in Ivins City. This is 33.33% of the commercial structures in Ivins City. The value of those structures is estimated at $3,441,284. There are 8 businesses at high risk from wildfire in Ivins City. This is 38.09% of the commercial structures in Ivins City. The value of those structures is estimated at $3,932,011.

In LaVerkin City there are approximately 204 homes at high risk from wildfire. These account for 20.05% of the 1,017 residential structures in LaVerkin City. The value of the structures at risk is estimated to be $16,041,141. Based upon the average household size in LaVerkin City of 3.20 persons, there are approximately 653 persons at high risk from wildfire. This is 19.25% of the 3,392 population of LaVerkin City. There are 26 businesses at moderate risk from wildfire in LaVerkin City. This is 52.00% of the commercial structures in LaVerkin City. The value of those structures is estimated at $6,573,897. There are 13 businesses at high risk from wildfire in LaVerkin City. This is 26.00% of the commercial structures in LaVerkin City. The value of those structures is estimated at $3,286,949.

In the town of Leeds there are approximately 36 homes at moderate risk from wildfire. These account for 16.51% of the 218 residential structures in the town of Leeds. The value of the structures at risk is estimated to be $5,067,790. Based upon the average household size in the town of Leeds of 2.64 persons, there are approximately 95 persons at moderate risk from wildfire. This is 17.36% of the 547 population of the town. There are approximately 2 homes at high risk from wildfire. These account for 0.91% of the 218 residential structures in the town of Leeds. The value of the structures at risk is estimated to be $281,178. Based upon the average household size in Leeds of 2.64 persons, there are approximately 5 persons at high risk from wildfire. This is 0.91% of the 547 population of Leeds. There are 2 businesses at moderate risk from wildfire in the town of Leeds. This is 22.22% of the commercial structures in the town. The value of those structures is estimated at $184,362.

In the town of New Harmony there are approximately 3 homes at moderate risk from wildfire. These account for 3.26% of the 92 residential structures in the town. The value of the structures at risk is estimated to be $221,660. Based upon the average household size in the town of New Harmony of 2.75 persons, there are approximately 8 persons at moderate risk from wildfire. This is 4.21% of the 190 population of the town.

In St. George City there are approximately 230 homes at moderate risk from wildfire. These account for 1.15% of the 19,851 residential structures in St. George City. The value of the structures at risk is estimated to be $26,399,953. Based upon the average household size in St. George City of 2.81 persons, there are approximately 646 persons at moderate risk from wildfire. This is 1.30% of the 49,663 population of the City. There are approximately 3,010 homes at high risk from wildfire. These account for 15.16% of the 19,851 residential structures in the City. The value of the structures at risk is estimated to be $345,458,680. Based upon the average household size in St. George City of 2.81 persons, there are approximately 8,458 persons at high risk from wildfire. This is 17.03% of the 49,663 population of St. George City. There are approximately 33 business structures at moderate risk from wildfire in St. George City. This is approximately 2.36% of the commercial structures in the City. The value of those structures is estimated at $11,408,360. There are approximately 365 businesses at high risk from wildfire in St. George City. This is 26.18% of the commercial structures in St. George City. The value of those structures is estimated at $126,516,229.

In Santa Clara City there are approximately 117 homes at high risk from wildfire. These account for 8.00% of the 1,461 residential structures in Santa Clara City. The value of the structures at risk is estimated to be $15,465,139. Based upon the average household size in Santa Clara City of 3.78 persons, there are approximately 442 persons at high risk from wildfire. This is 9.54% % of the 4,630 population of Santa Clara City. There are 7 businesses at high risk from wildfire in Santa Clara City. This is 58.33% of the commercial structures in the City. The value of those structures is estimated at $2,281,976.

In the town of Springdale there are approximately 4 homes at moderate risk from wildfire. These account for 1.76% of the 226 residential structures in the town of Springdale. The value of the structures at risk is estimated to be $417,831. Based upon the average household size in the town of Springdale of 2.38 persons, there are approximately 10 persons at moderate risk from wildfire. This is 2.18% of the 457 population of the town. There is one business at moderate risk from wildfire in the town of Springdale. This is 1.78% of the commercial structures in the town. The value of that structure is estimated at $400,516.

In Toquerville City there are approximately 66 homes at moderate risk from wildfire. These account for 19.29% of the 342 residential structures in Toquerville City. The value of the structures at risk is estimated to be $6,557,010. Based upon the average household size in Toquerville City of 3.23 persons, there are approximately 213 persons at moderate risk from wildfire. This is 23.40% of the 910 population of Toquerville City. There are approximately 18 homes at high risk from wildfire. These account for 5.26% of the 342 residential structures in Toquerville City. The value of the structures at risk is estimated to be $1,787,799. Based upon the average household size in Toquerville City of 3.23 persons, there are approximately 58 persons at high risk from wildfire. This is 6.37% of the 910 population of Toquerville City. There is one business at moderate risk from wildfire in Toquerville City. This is 33.33% of the commercial structures in Toquerville City. The value of that structure is estimated at $86,487. There are 2 businesses at high risk from wildfire in Toquerville City. This is 66.66% of the commercial structures in Toquerville City. The value of those structures is estimated at $172,974.

In Washington City there are approximately 106 homes at moderate risk from wildfire. These account for 2.92% of the 3,626 residential structures in Washington City. The value of the structures at risk is estimated to be $10,252,929. Based upon the average household size in Washington City of 3.00 persons, there are approximately 318 persons at moderate risk from wildfire. This is 3.88% of the 8,186 population of Washington City. There are approximately 86 businesses at moderate risk from wildfire in Washington City. This is approximately 49.71% of the commercial structures in Washington City. The value of those structures is estimated at $23,827,877. There are approximately 17 businesses at high risk from wildfire in Washington City. This is approximately 9.82% of the commercial structures in Washington City. The value of those structures is estimated at $4,707,096.

Number of People/Buildings Impacted by Wildfire

Table 64 Analysis of Wildfire Risk in Washington County

Enterprise - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	434	10	2.30%	$33,402,680	$769,647	2.30%	1,285	34	2.64%
Commercial	23	0	0%	$2,210,150	$0	0%	N/A	N/A	N/A
Total	457	10	2.18%	$35,612,830	$769,647	2.16%	1,285	34	2.64%

Hildale – Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	243*	0	0%	$25,505,620	$0	0%	1,895	0	0%
Commercial	32	0	0%	$6,527,949	$0	0%	N/A	N/A	N/A
Total	275	0	0%	$ 32,033,569	$0	0%	1,895	0	0%

*source: U.S. Census Bureau, Census 2000

Hurricane - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2,991	250	8.35%	$283,186,314	$23,646,057	8.35%	8,250	742	8.99%
Commercial	221	144	65.15%	$71,593,541	$46,643,192	65.15%	N/A	N/A	N/A
Total	3,212	394	12.26%	$354,779,855	$70,289,249	19.81%	8,250	742	8.99%

Ivins - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2,103	175	8.32%	$250,247,181	$20,820,565	8.32%	4,450	542	12.17%
Commercial	21	15	71.42%	$10,323,853	$7,373,295	71.42%	N/A	N/A	N/A
Total	2,124	190	8.94%	$260,571,034	$28,193,860	10.82%	4,450	542	12.17%

La Verkin - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,017	204	20.05%	$80,005,690	$16,041,141	20.05%	3,392	653	19.25%
Commercial	50	39	78.00%	$12,642,111	$9,860,846	78.00%	N/A	N/A	N/A
Total	1,067	243	22.77%	$92,647,801	$25,901,987	27.95%	3,392	653	19.25%

Leeds - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	218	38	17.43%	$30,688,289	$5,348,968	17.43%	547	100	18.28%
Commercial	9	2	22.22%	$829,715	$184,362	22.22%	N/A	N/A	N/A
Total	227	40	17.62%	$31,518,004	$5,533,330	17.55%	547	100	18.28%

New Harmony - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	92	3	3.26%	$6,799,397	$221,660	3.26%	190	8	4.21%
Commercial	1	0	0%	$6,302	$0	0%	N/A	N/A	N/A
Total	93	3	3.22%	$6,805,699	$221,660	3.25%	190	8	4.21%

Rockville - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	137	0	0%	$11,655,825	$0	0%	247	0	0%
Commercial	2	0	0%	$1,053,524	$0	0%	N/A	N/A	N/A
Total	139	0	0%	$12,709,349	$0	0%	247	0	0%

St. George - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	19,851	3,240	16.32%	$2,278,545,551	$371,858,633	16.32%	49,663	9,104	18.33%
Commercial	1,394	399	28.62%	$481,916,804	$137,924,589	28.62%	N/A	N/A	N/A
Total	21,245	3,639	17.12%	$2,760,462,355	$509,783,222	18.46%	49,663	9,104	18.33%

Santa Clara - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,461	117	8.00%	$193,314,237	$15,465,139	8.00%	4,630	442	9.54%
Commercial	12	7	58.33%	$3,911,959	$2,281,976	58.33%	N/A	N/A	N/A
Total	1,473	124	8.41%	$197,226,196	$17,747,115	8.99%	4,630	442	9.54%

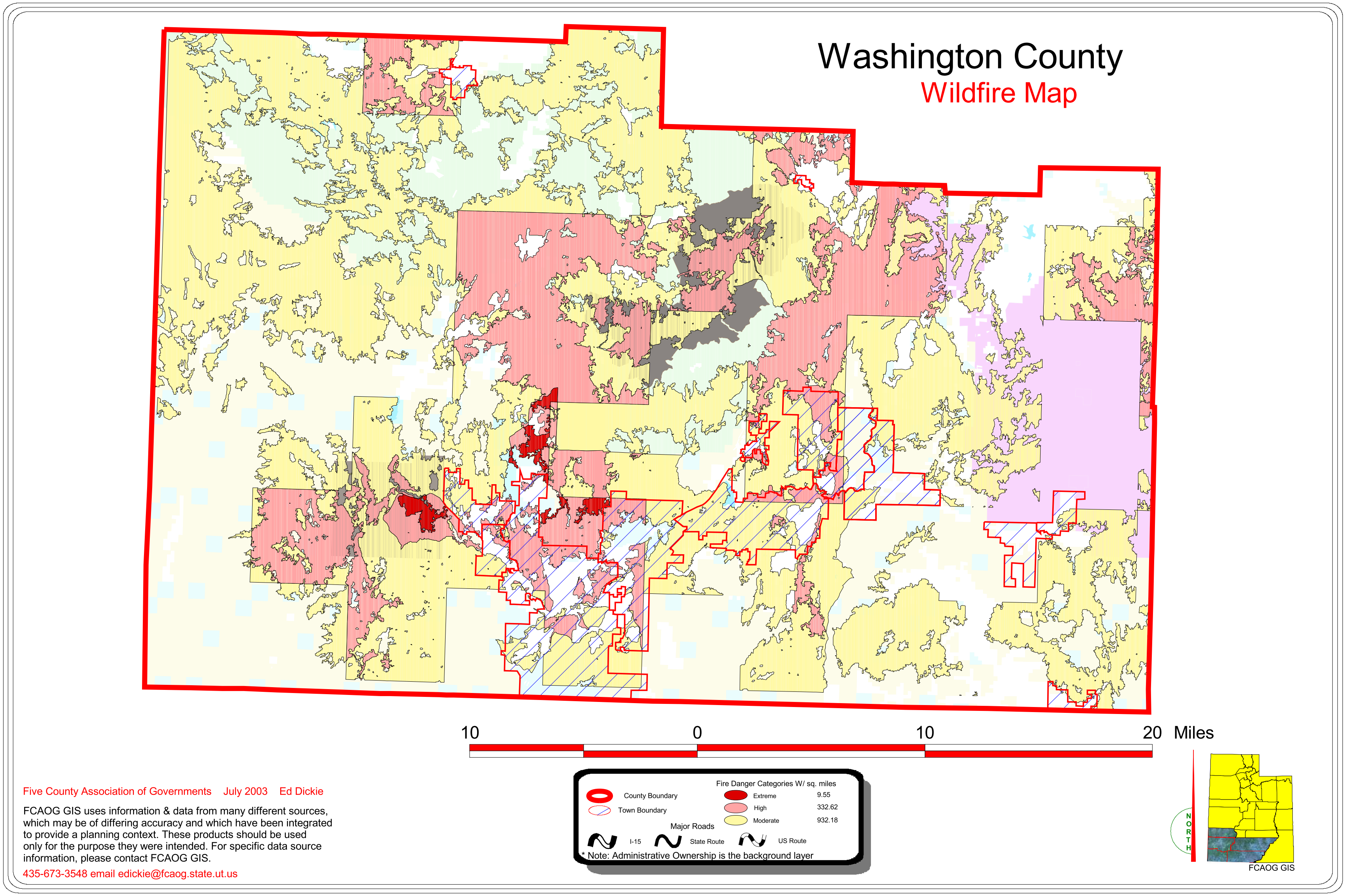
Springdale - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	226	4	1.76%	$23,740,428	$417,831	1.76%	457	10	2.18%
Commercial	56	1	1.78%	$22,500,887	$400,516	1.78%	N/A	N/A	N/A
Total	282	5	1.77%	$46,241,315	$818,347	1.76%	457	10	2.18%

Toquerville - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	342	84	24.56%	$33,977,235	$8,344,809	24.56%	910	271	29.78%
Commercial	3	3	100%	$259,461	$259,461	100%	N/A	N/A	N/A
Total	345	87	25.21%	$34,236,696	$8,604,270	25.13%	910	271	29.78%

Virgin - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	164	0	0%	$12,125,010	$0	0%	394	0	0%
Commercial	7	0	0%	$1,633,519	$0	0%	N/A	N/A	N/A
Total	171	0	0%	$13,758,529	$0	0%	394	0	0%

Washington - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,626	106	2.92%	$351,127,720	$10,252,929	2.92%	8,186	318	3.88%
Commercial	173	103	59.53%	$47,933,770	$28,534,973	59.53%	N/A	N/A	N/A
Total	3,799	209	5.50%	$399,061,490	$38,787,902	9.71%	8,186	318	3.88%

Unincorporated Washington County areas - Wildfire									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,023	297	9.82%	$322,960,038	$31,714,675	9.82%	5,858	882	15.05%
Commercial	33	0	0%	$6,460,642	$0	0%	N/A	N/A	N/A
Total	3,056	297	9.71%	$329,420,680	$31,714,675	9.62%	5,858	882	15.05%


Washington County
Wildfire Map
10
0
10
20
Miles
County Boundary
Town Boundary
Fire Danger Categories W/ sq. miles
Extreme 9.55
High 332.62
Moderate 932.18
Major Roads
I-15
State Route
US Route
* Note: Administrative Ownership is the background layer
NORTH
FCAOG GIS
Five County Association of Governments July 2003 Ed Dickie
FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.
435-673-3548 email edickie@fcaog.state.ut.us

Landslides

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe. The location of potential slope failures and landslides is spread throughout the county. Table 65 assesses the risk to structures in incorporated and unincorporated potions of Washington County.
Duration: range from very short duration slope failures to long-term ground movement. Duration varies by location.

Assessing Vulnerability

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available data, has identified residential and commercial structures at risk from landslide. See Table 65 for an analysis of landslide risk in Washington County.

According to available data, there are 87 residential structures at risk from landslide in unincorporated Washington County. This is 2.87% of the residential units in unincorporated Washington County. The market value of those structures is estimated to be $9,294,582. Based upon an estimated 1.93 persons per household, there are 168 persons at risk from landslide in unincorporated Washington County.

According to available data, there are 79 residential structures at risk from landslide in Washington City. This is 2.18% of the residential units in Washington City. The market value of those structures is estimated to be $7,650,052. Based upon an estimated 3.00 persons per household, there are 237 persons at risk from landslide in Washington City.

According to available data, there are 63 residential structures at risk from landslide in Springdale. This is 27.87% of the residential units in Springdale. The market value of those structures is estimated to be $6,616,457. Based upon an estimated 2.38 persons per household, there are 150 persons at risk from landslide in Springdale.

According to available data, there are 36 residential structures at risk from landslide in St. George. This is 0.18% of the residential units in St. George. The market value of those structures is estimated to be $4,132,166. Based upon an estimated 2.81 persons per household, there are 101 persons at risk from landslide in St. George.

According to available data, there are 4 residential structures at risk from landslide in Santa Clara City. This is 0.27% of the residential units in Santa Clara. The market value of those structures is estimated to be $529,265. Based upon an estimated 3.78 persons per household, there are 15 persons at risk from landslide in Santa Clara.

According to available data, there are 4 residential structures at risk from landslide in Toquerville City. This is 1.17% of the residential units in Toquerville. The market value of those structures is estimated to be $397,394. Based upon an estimated 3.23 persons per household, there are 13 persons at risk from landslide in Toquerville.

According to available data, there are 4 residential structures at risk from landslide in Hurricane City. This is 0.06% of the residential units in Hurricane. The market value of those structures is estimated to be $189,359. Based upon an estimated 2.97 persons per household, there are 6 persons at risk from landslide in Hurricane.

Available data also indicates that there appears to be no commercial structures at risk from landslide in Washington County.

Number of People/Buildings Impacted by Landslides

Table 65 Analysis of Landslide Risk in Washington County

Enterprise - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	434	0	0%	$33,402,680	$0	0%	1,285	0	0%
Commercial	23	0	0%	$2,210,150	$0	0%	N/A	N/A	N/A
Total	457	0	0%	$35,612,830	$0	0%	1,285	0	0%

Hildale – Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	243*	0	0%	$25,505,620	$0	0%	1,895	0	0%
Commercial	32	0	0%	$6,527,949	$0	0%	N/A	N/A	N/A
Total	275	0	0%	$ 32,033,569	$0	0%	1,895	0	0%

*source: U.S. Census Bureau, Census 2000

Hurricane - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2,991	2	0.06%	$283,186,314	$189,359	0.06%	8,250	6	0.07%
Commercial	221	0	0%	$71,593,541	$0	0%	N/A	N/A	N/A
Total	3,212	2	0.06%	$354,779,855	$189,359	0.05%	8,250	6	0.07%

Ivins - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2,103	0	0%	$250,247,181	$0	0%	4,450	0	0%
Commercial	21	0	0%	$10,323,853	$0	0%	N/A	N/A	N/A
Total	2,124	0	0%	$260,571,034	$0	0%	4,450	0	0%

La Verkin - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,017	0	0%	$80,005,690	$0	0%	3,392	0	0%
Commercial	50	0	0%	$12,642,111	$0	0%	N/A	N/A	N/A
Total	1,067	0	0%	$92,647,801	$0	0%	3,392	0	0%

Leeds - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	218	0	0%	$30,688,289	$0	%	547	0	0%
Commercial	9	0	0%	$829,715	$0	0%	N/A	N/A	N/A
Total	227	0	0%	$31,518,004	$0	0%	547	0	0%

New Harmony - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	92	0	0%	$6,799,397	$0	0%	190	0	0%
Commercial	1	0	0%	$6,302	$0	0%	N/A	N/A	N/A
Total	93	0	0%	$6,805,699	$0	0%	190	0	0%

Rockville - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	137	0	0%	$11,655,825	$0	0%	247	0	0%
Commercial	2	0	0%	$1,053,524	$0	0%	N/A	N/A	N/A
Total	139	0	0%	$12,709,349	$0	0%	247	0	%

St. George - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	19,851	36	0.18%	$2,278,545,551	$4,132,166	0.18%	49,663	101	0.20%
Commercial	1,394	0	0%	$481,916,804	$0	0%	N/A	N/A	N/A
Total	21,245	36	0.17%	$2,760,462,355	$4,132,166	0.17%	49,663	101	0.20%

Santa Clara - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,461	4	0.27%	$193,314,237	$529,265	0.27%	4,630	15	0.32%
Commercial	12	0	0%	$3,911,959	$0	0%	N/A	N/A	N/A
Total	1,473	4	0.27%	$197,226,196	$529,265	0.27%	4,630	15	0.32%

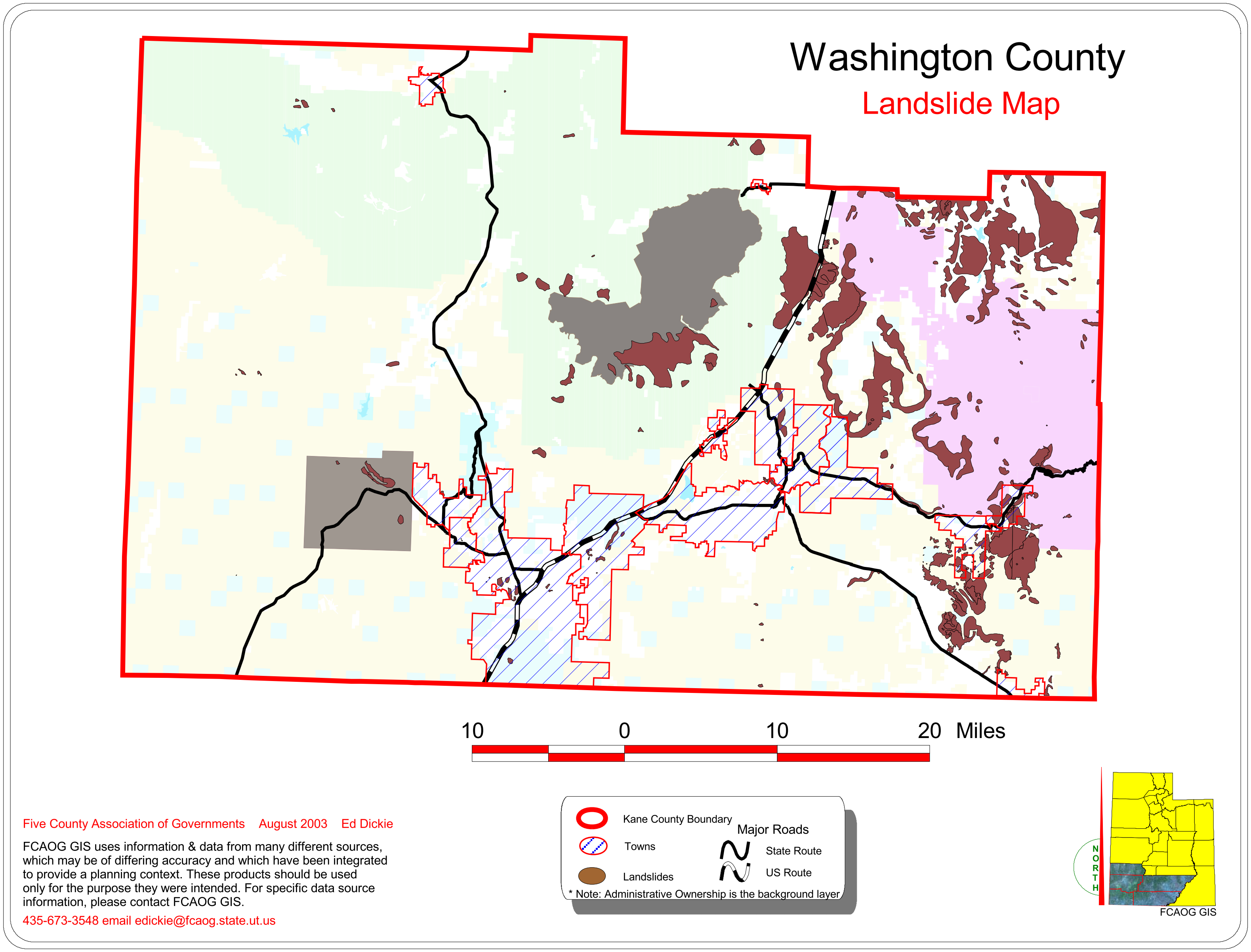
Springdale - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	226	63	27.87%	$23,740,428	$6,616,457	27.87%	457	150	32.82%
Commercial	56	0	0%	$22,500,887	$0	0%	N/A	N/A	N/A
Total	282	63	22.34%	$46,241,315	$6,616,457	0%	457	150	32.82%

Toquerville - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	342	4	1.17%	$33,977,235	$397,394	1.17%	910	13	1.43%
Commercial	3	0	0%	$259,461	$0	0%	N/A	N/A	N/A
Total	345	0	0%	$34,236,696	$397,394	1.16%	910	13	1.43%

Virgin - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	164	0	0%	$12,125,010	$0	0%	394	0	0%
Commercial	7	0	0%	$1,633,519	$0	0%	N/A	N/A	N/A
Total	171	0	0%	$13,758,529	$0	0%	394	0	0%

Washington - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,626	79	2.18%	$351,127,720	$7,650,052	2.18%	8,186	237	2.89%
Commercial	173	0	0%	$47,933,770	$0	0%	N/A	N/A	N/A
Total	3,799	79	2.08%	$399,061,490	$7,650,052	1.92%	8,186	237	2.89%

Unincorporated Washington County areas - Landslide									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,023	87	2.87%	$322,960,038	$9,294,582	2.87%	5,858	168	2.87%
Commercial	33	0	0%	$6,460,642	$0	0%	N/A	N/A	N/A
Total	3,056	87	2.84%	$329,420,680	$9,294,582	2.82%	5,858	168	2.87%


Washington County
Landslide Map
10 0 10 20 Miles
Kane County Boundary
Towns
Landslides
Major Roads
State Route
US Route
* Note: Administrative Ownership is the background layer
NORTH
FCAOG GIS
Five County Association of Governments August 2003 Ed Dickie
FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.
435-673-3548 email edickie@fcaog.state.ut.us

Earthquake

Assessing Vulnerability and Overall Summary of Impacts

HAZUS MH Earthquake Vulnerability Assessment

See Table 66 below for an estimate of earthquake casualties.

Table 66 Earthquake Casualties Risk in Washington County

Casualties	Nighttime –Minor	583
	Nighttime –Major	13
	Nighttime -Fatalities	25
	Daytime –Minor	707
	Daytime –Major	23
	Daytime- Fatalities	45
	Commute –Minor	582
	Commute –Major	18
	Commute-Fatalities	34

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 67 below lists the number buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 67 Building Damage from Moderate to Complete by Count

Category	Number of Structures	Total Cost in millions of dollars **
Residential	3,338	575.45
Commercial	215	160.95
Industrial	24	34.17
Totals	14,114*	789.62**

*****Includes all building categories with moderate to complete damage
** Structural, non-structural, content, inventory

Table 68 Damage to Critical Facilities from Moderate to Complete

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	2	0	0	0
Schools	33	0	0	0
EOCs	1	0	0	1
Police Stations	3	0	0	0
Fire Stations	6	0	0	0

Debris Removal –Table 69 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 69 –Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	567
Loads (25 tons per load)	22,680

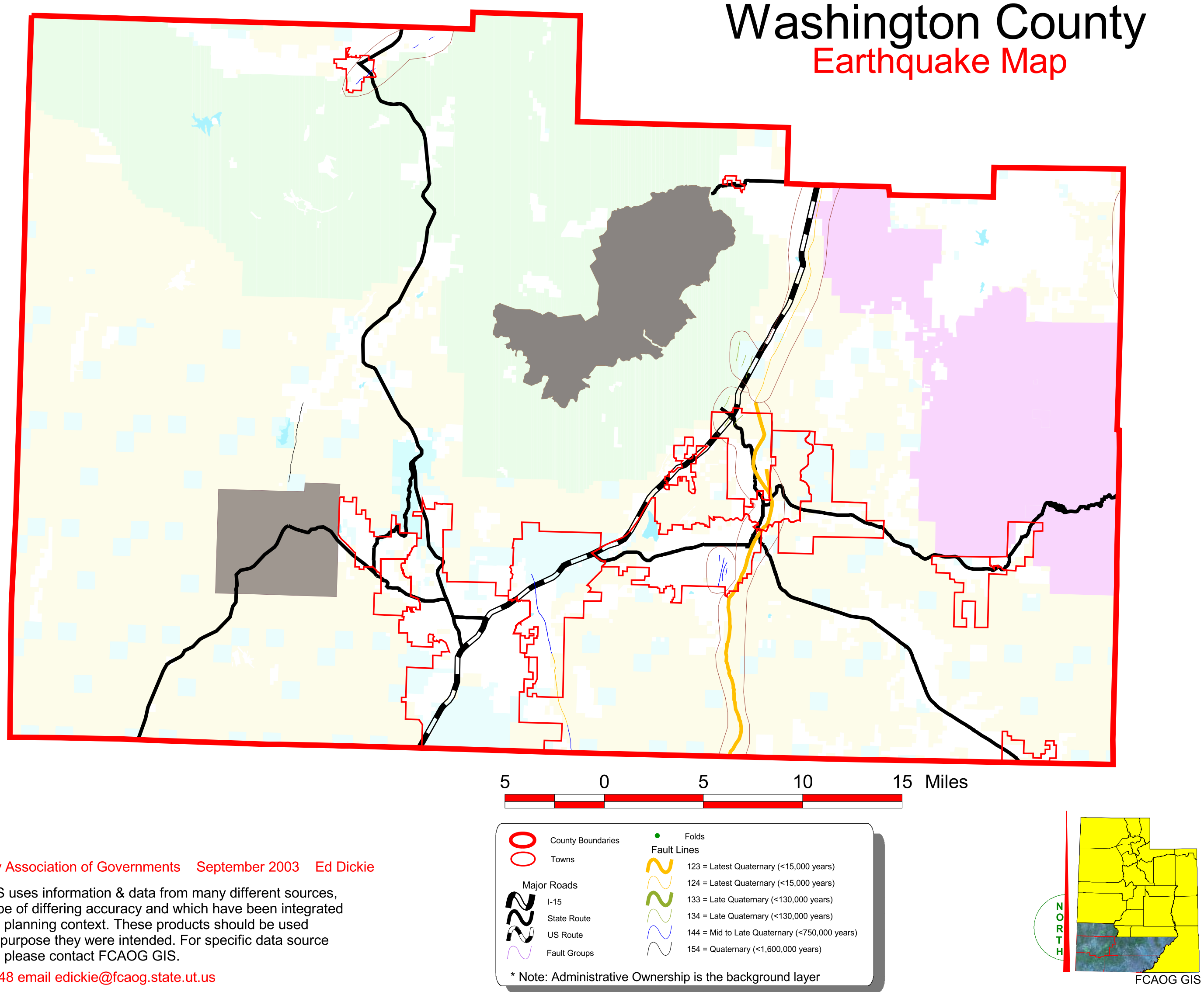
Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 70 below provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 70 –Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	3
People Displaced	29
Value Exposed (mill. $)	2

These numbers were derived from a HAZUS MH run based on a probabilistic 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete HAZUS MH run performed by the Utah Division of Emergency Services and Homeland Security is available at the Five County Association of Governments.

Washington County
Earthquake Map



Five County Association of Governments September 2003 Ed Dickie

FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.

435-673-3548 email edickie@fcaog.state.ut.us

Flood

FEMA Hazard Profile

Frequency: Likely
Severity: Negligible to severe depending on location.
Duration: range from very short duration flash flooding to longer-term inundation. Duration varies by location.

Assessing Vulnerability

Overall Summary of Impacts

The Five County Association of Governments GIS, utilizing available floodplain data, has identified residential and commercial structures located within the 100-year floodplain (A Zone). See Table 71 for an analysis of flood risk in Washington County.

Based upon review of available data, in the City of Hildale there are 2 residential structures located in a floodplain (A Zone). Homes located in floodplains account for 0.82% of the residential structures in Hildale. Based upon an estimated average market value of residential structures in the city, the market value of those structures is approximately $209,922. Based upon an average household size (U.S. Census Bureau, Census 2000) of 8.17 persons per household in Hildale, there are approximately 16 persons at risk from floodplains.

Based upon review of available data, in the City of Ivins there are 595 residential structures located in a floodplain (A Zone). Homes located in floodplains account for 28.29% of the residential structures in Ivins. Based upon an estimated average market value of residential structures in the city, the market value of those structures is approximately $70,802,222. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.10 persons per household in Ivins, there are approximately 1,844 persons at risk from floodplains. There are approximately 13 businesses in Ivins located in a floodplain. This is 61.90% of the businesses in the city with a market value of approximately $6,390,956.

Based upon review of available data, in the City of LaVerkin there are 11 residential structures located in a floodplain (A Zone). Homes located in floodplains account for 1.08% of the residential structures in LaVerkin. Based upon an estimated average market value of residential structures in the city, the market value of those structures is approximately $865,351. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.20 persons per household in LaVerkin, there are approximately 35 persons at risk from floodplains.

Based upon review of available data, in the town of Leeds there is one residential structure located in a floodplain (A Zone). This home located in floodplains accounts for 0.45% of the residential structures in Leeds. Based upon an estimated average market value of residential structures in the town, the market value of this structure is approximately $140,722. Based upon an average household size (U.S. Census Bureau, Census 2000) of 2.64 persons per household in Leeds, there are approximately 3 persons at risk from floodplains.

Based upon review of available data, in the town of Rockville there are 14 residential structures located in a floodplain (A Zone). The homes located in floodplains account for 10.21% of the residential structures in Rockville. Based upon an estimated average market value of residential structures in the town, the market value of these structures is approximately $1,191,106. Based upon an average household size (U.S. Census Bureau, Census 2000) of 2.15 persons per household in Rockville, there are approximately 30 persons at risk from floodplains.

Based upon review of available data, in St. George City there are approximately 741 residential structures located in a floodplain (A Zone). Homes located in floodplains account for 3.73% of the residential structures in St. George. Based upon an estimated average market value of residential structures in the city, the market value of those structures is approximately $85,083,763. Based upon an average household size (U.S. Census Bureau, Census 2000) of 2.81 persons per household in St. George, there are approximately 2,082 persons at risk from floodplains. There are approximately 82 businesses in St. George located in a floodplain. This is 5.88% of the businesses in the city with a market value of approximately $28,348,047.

Based upon review of available data, in Santa Clara City there are approximately 143 residential structures located in a floodplain (A Zone). Homes located in floodplains account for 9.78% of the residential structures in Santa Clara. Based upon an estimated average market value of residential structures in the city, the market value of those structures is approximately $18,921,243. Based upon an average household size (U.S. Census Bureau, Census 2000) of 2.81 persons per household in Santa Clara, there are approximately 540 persons at risk from floodplains.

Based upon review of available data, in the town of Springdale there are approximately 152 residential structures located in a floodplain (A Zone). The homes located in floodplains account for 67.25% of the residential structures in Springdale. Based upon an estimated average market value of residential structures in the town, the market value of these structures is approximately $15,967,013. Based upon an average household size (U.S. Census Bureau, Census 2000) of 2.38 persons per household in Springdale, there are approximately 362 persons at risk from floodplains. There are approximately 20 businesses in Springdale located in a floodplain. This is 35.71% of the businesses in the town with a market value of approximately $8,036,031.

Based upon review of available data, in Toquerville City there are approximately 7 residential structures located in a floodplain (A Zone). Homes located in floodplains account for 2.05% of the residential structures in Toquerville. Based upon an estimated average market value of residential structures in the city, the market value of those structures is approximately $695,440. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.23 persons per household in Toquerville, there are approximately 23 persons at risk from floodplains.

Based upon review of available data, in the town of Virgin there are 26 residential structures located in a floodplain (A Zone). The homes located in floodplains account for 15.85% of the residential structures in Virgin. Based upon an estimated average market value of residential structures in the town, the market value of these structures is approximately $1,922,257. Based upon an average household size (U.S. Census Bureau, Census 2000) of 2.70 persons per household in Virgin, there are approximately 70 persons at risk from floodplains. There is one business in Virgin located in a floodplain. This is 14.28% of the businesses in the town with a market value of approximately $233,359.

Based upon review of available data, in Washington City there are approximately 167 residential structures located in a floodplain (A Zone). Homes located in floodplains account for 4.60% of the residential structures in Washington. Based upon an estimated average market value of residential structures in the city, the market value of those structures is approximately $16,171,629. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.00 persons per household in Washington City, there are approximately 501 persons at risk from floodplains.

Based upon review of available data, in the City of Enterprise there are approximately 29 residential structures located in a floodplain (A Zone). Homes located in floodplains account for 6.68% of the residential structures in Enterprise. Based upon an estimated average market value of residential structures in the city, the market value of those structures is approximately $2,231,976. Based upon an average household size (U.S. Census Bureau, Census 2000) of 3.40 persons per household in the City of Enterprise, there are approximately 99 persons at risk from floodplains.

Based upon review of available data, in unincorporated Washington County there are a total of 46 residential structures located in a Floodplain (A Zone). Twenty-six of these structures are located in Zion National Park and are not private homes. These 46 homes account for 1.52% of the homes in unincorporated Washington County. Eleven homes are located in the Pine Valley area. Seven are located in the New Harmony area. Two homes are located along the road to Kolob Reservoir. Based upon an average market value of residential structures in unincorporated Washington County, the market value of those 46 structures is approximately $4,914,377. Based an average household size (U.S. Census Bureau, Census 2000) of 2.97 persons per household in Washington County, there are approximately 137 persons at risk from floodplains in unincorporated Washington County. There is one business in unincorporated Washington County located in a floodplain. This is 3.03% of the businesses in unincorporated Washington County with a market value of approximately $195,777.

Number of People and Buildings/Structures Impacted by Floodplains

Table 71 Analysis of Flood Risk in Washington County

Enterprise – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	434	29	6.68%	$33,402,680	$2,231,976	6.68%	1,285	99	7.70%
Commercial	23	0	0%	$2,210,150	$0	0%	N/A	N/A	N/A
Total	457	29	6.34%	$35,612,830	$2,231,976	6.26%	1,285	99	7.70%

Hildale – Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	243*	2	0.82%	$25,505,620	$209,922	0.82%	1,895	16	0%
Commercial	32	0	0%	$6,527,949	$0	0%	N/A	N/A	N/A
Total	275	2	0.82%	$ 32,033,569	$209,922	0.65%	1,895	16	0%

Hurricane - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2,991	0	0%	$283,186,314	$0	0%	8,250	0	0%
Commercial	221	0	0%	$71,593,541	$0	0%	N/A	N/A	N/A
Total	3,212	0	0%	$354,779,855	$0	0%	8,250	0	%

Ivins - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	2,103	595	28.29%	$250,247,181	$70,802,222	28.29%	4,450	1,844	41.43%
Commercial	21	13	61.90%	$10,323,853	$6,390,956	61.90%	N/A	N/A	N/A
Total	2,124	608	28.62%	$260,571,034	$77,193,178	29.62%	4,450	1,844	41.43%

La Verkin - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	1,017	11	1.08%	$80,005,690	$865,351	1.08%	3,392	35	1.03%
Commercial	50	0	0%	$12,642,111	$0	0%	N/A	N/A	N/A
Total	1,067	11	1.03%	$92,647,801	$865,351	0.93%	3,392	35	1.03%

Leeds - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	218	1	0.45%	$30,688,289	$140,772	0.45%	547	3	0.54%
Commercial	9	0	0%	$829,715	$0	0%	N/A	N/A	N/A
Total	227	1	0.44%	$31,518,004	$140,722	0.44%	547	3	0.54%

New Harmony - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	92	0	0%	$6,799,397	$0	0%	190	0	0%
Commercial	1	0	0%	$6,302	$0	0%	N/A	N/A	N/A
Total	93	0	0%	$6,805,699	$0	0%	190	0	0%

Rockville - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	137	14	10.21%	$11,655,825	$1,191,106	10.21%	247	30	12.14%
Commercial	2	0	0%	$1,053,524	$0	0%	N/A	N/A	N/A
Total	139	14	10.07%	$12,709,349	$1,191,106	9.37%	247	30	12.14%

St. George - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	19,851	741	3.73%	$2,278,545,551	$85,083,763	3.73%	49,663	2,082	4.19%
Commercial	1,394	82	5.88%	$481,916,804	$28,348,047	5.88%	N/A	N/A	N/A
Total	21,245	823	3.87%	$2,760,462,355	$106,936,244	3.87%	49,663	2,082	4.19%

Santa Clara - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	1,461	143	9.78%	$193,314,237	$18,921,243	9.78%	4,630	540	11.66%
Commercial	12	0	0%	$3,911,959	$0	0%	N/A	N/A	N/A
Total	1,473	143	9.71%	$197,226,196	$18,921,243	9.59%	4,630	540	11.66%

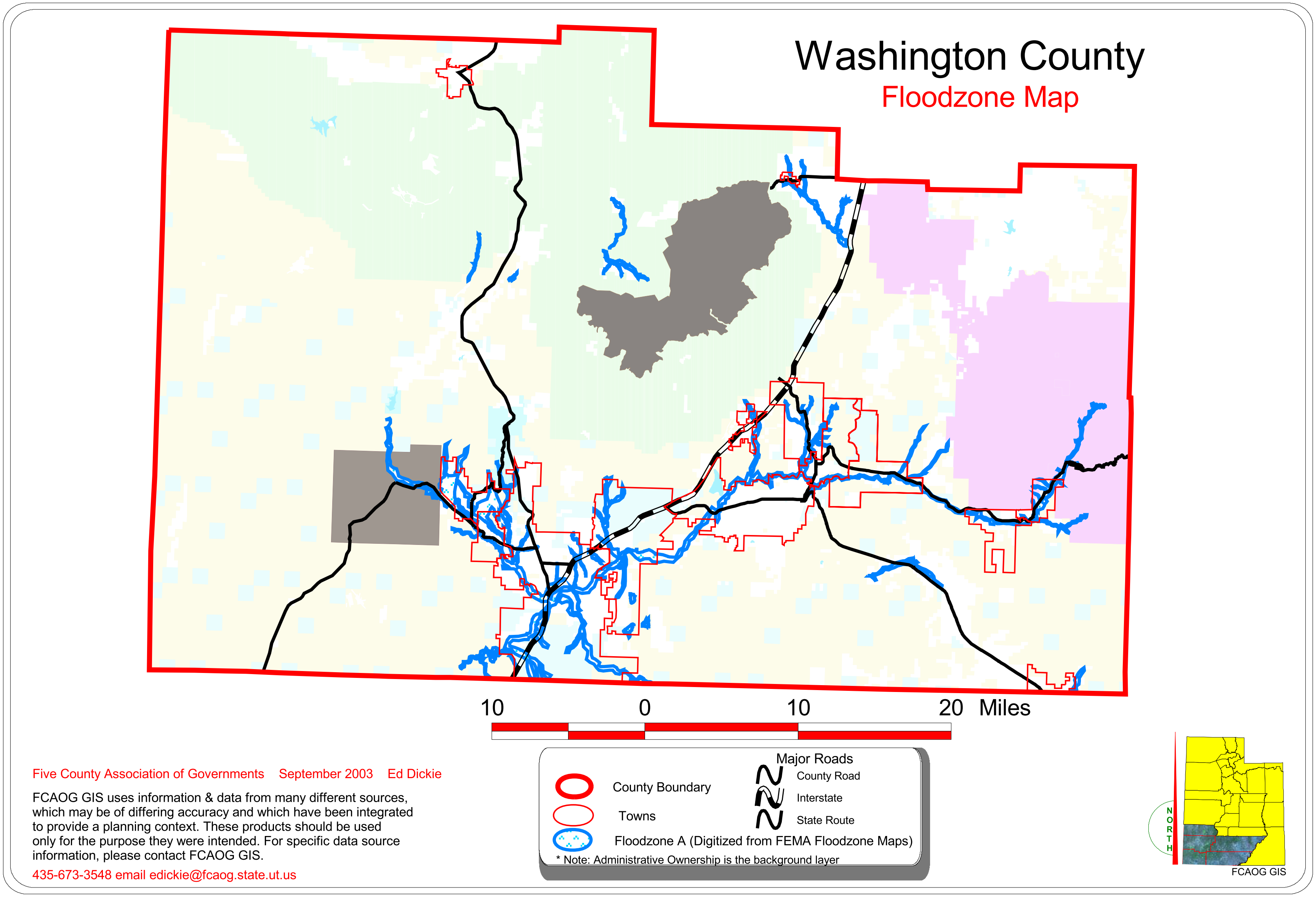
Springdale - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	226	152	67.25%	$23,740,428	$15,967,013	67.25%	457	362	79.21%
Commercial	56	20	35.71%	$22,500,887	$8,036,031	35.71%	N/A	N/A	N/A
Total	282	172	60.99%	$46,241,315	$24,003,044	51.91%	457	362	79.21%

Toquerville - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	342	7	2.05%	$33,977,235	$695,440	2.04%	910	23	2.52%
Commercial	3	0	0%	$259,461	$0	0%	N/A	N/A	N/A
Total	345	7	2.02%	$34,236,696	$695,440	2.03%	910	23	2.52%

Virgin - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	164	26	15.85%	$12,125,010	$1,922,257	15.85%	394	70	17.76%
Commercial	7	1	14.28%	$1,633,519	$233,359	14.28%	N/A	N/A	N/A
Total	171	27	15.79%	$13,758,529	$2,155,616	15.66%	394	70	17.76%

Washington - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,626	167	4.60%	$351,127,720	$16,171,629	4.60%	8,186	501	6.12%
Commercial	173	0	0%	$47,933,770	$0	0%	N/A	N/A	N/A
Total	3,799	167	4.39%	$399,061,490	$16,171,629	4.05%	8,186	501	6.12%

Unincorporated Washington County areas - Floodplains									
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ in Comm-unity	$ in Hazard Area	% in Hazard Area	# in Comm-unity	# in Hazard Area	% in Hazard Area
Residential	3,023	46	1.52%	$322,960,038	$4,914,377	1.52%	5,858	137	2.33%
Commercial	33	1	3.03%	$6,460,642	$195,777	3.03%	N/A	N/A	N/A
Total	3,056	47	1.54%	$329,420,680	$5,110,154	1.55%	5,858	137	2.33%


Washington County
Floodzone Map
10 0 10 20 Miles
Five County Association of Governments September 2003 Ed Dickie
FCAOG GIS uses information & data from many different sources, which may be of differing accuracy and which have been integrated to provide a planning context. These products should be used only for the purpose they were intended. For specific data source information, please contact FCAOG GIS.
435-673-3548 email edickie@fcaog.state.ut.us
Major Roads
County Road
Interstate
State Route
County Boundary
Towns
Floodzone A (Digitized from FEMA Floodzone Maps)
* Note: Administrative Ownership is the background layer
NORTH
FCAOG GIS

Mitigation Strategies

A section of the planning process, included in Appendix P details how the mitigation projects were identified and prioritized. The projects in that process were prioritized utilizing the concepts of the STAPLEE explained in FEMA 386-3. Normally used to evaluate alternative mitigation actions for a single identified problem, the STAPLEE process, in this case was used as a rational basis to determine the prioritization of each mitigation project. These projects were submitted by an expanded LEPC in each county for inclusion in the plan. The Planning Team believes that using the STAPLEE provided a reasonable and objective means to determine relative priority of the mitigation actions identified in this plan. The STAPLEE process allows for a review of each project based upon the following considerations:

- **S**ocial- Is the proposed action/project socially acceptable to the community and does it unfairly affect one segment of the community?
- **T**echnical- Is the action/project feasible from a technical standpoint? Can it be accomplished using available engineering practices?
- **A**dministrative- Is there adequate staffing, funding and maintenance available for the proposed mitigation project?
- **P**olitical- Is there political support for the proposed action/project?
- **L**egal- Does the jurisdiction possess the appropriate legal authority to undertake the action/project?
- **E**conomic-Are there sources of funding to accomplish the action/project? What benefits does the action/project provide and are the estimated costs in line with the benefits the action/project would provide?
- **E**nvironmental-Will the proposed action/project have an adverse effect on the environment (land, water, endangered species) and will the action/project comply with applicable environmental laws?

These factors were all considered, by each County LEPC, in determining a final relative score for each action/project listed below:

Drought

Region-wide Mitigation

Problem Identification: Several years of severe drought have affected southwestern Utah in varying degrees.

Goal R1- Priority Medium

Objective R1.1 - Providing drought education to the public
Action: Use several ways in educating the public on efficient water usage.

> **Time Frame:** Ongoing
> **Funding:** State and Federal grants and loans, federal program money, city and county funds, irrigation companies.
> **Estimated Cost:** Unknown
> **Staff:** Natural Resources Conservation Service, Utah Association of Conservation Districts, Utah State University Extension, Municipalities.
> **Background:** Research problem areas. Create programs to make the public aware. Use newsletters and the newspapers. Hold field trips.

County-specific Mitigation

Beaver County

Problem Identification: Inadequate Water Storage in Beaver County

Goal R2- Priority Medium

Objective R2.1 Developing more water storage capacity in several areas in Beaver County.
Action: Conduct feasibility study.
- **Time Frame:** 5 years
- **Funding:** Unknown
- **Estimated Cost:** Unknown
- **Staff:** Unknown
- **Background:** Contact land agencies and irrigation companies to see if studies have been done.

Problem Identification: Outdated irrigation systems throughout Beaver County.

Goal R3- Priority Medium

Objective R3.1 Upgrading irrigation systems.
Action: Put new hardware on the ground to improve efficiency of water.
- **Time Frame:** Ongoing
- **Funding:** State and Federal grants and loans.
- **Estimated Cost:** Unknown
- **Staff:** NRCS, UACD, USU Extension, etc.
- **Background:** This is an ongoing project at this time throughout the county.

Problem Identification: There has not been enforcement of water law.

Goal R4- Priority Low

Objective R4.1 Enforcing water law.
Action: Find out who is responsible to enforce the water law, then enforce it.
- **Time Frame:** 5 years
- **Funding:** Unknown
- **Estimated Cost:** Unknown
- **Staff:** Unknown
- **Background:** May start by litigation.

Problem Identification: Lack of public awareness of efficient water usage.

Goal R5 - Priority High

Objective R5.1 Education
Action: Use several ways in educating the public on efficient water usage.
- **Time Frame:** Ongoing

Funding: State and Federal grants and loans, federal program money, city and county funds, irrigation companies.
Estimated Cost: Unknown
Staff: NRCS, UACD, USU Extension, Municipalities.
Background: Research problem areas. Create programs to make the public aware. Use newsletters and the newspapers. Hold field trips.

Garfield

Problem Identification: Cyclical periods of drought place a strain on community culinary water resources.

Goal R6 - Priority Medium

Objective R6.1 Conserve culinary water by educating the public
Action: Educate the public on the need to be water wise
Time Frame: Ongoing
Funding: State grants, County funds
Estimated Cost: Minimal
Staff: Water districts, County, State
Background: Newsletter developed to educate general public on conserving water

Objective R6.2 Conserve culinary water by conservation
Action: Maintain and enforce rate policies that encourage water conservation
Time Frame: Ongoing
Funding: State grants, County funds
Estimated Cost: Minimal
Staff: Water districts, County, State
Background: Evaluate the use of a tiered water rate structure.

Problem Identification: Cyclical periods of drought place a strain on availability of community culinary and irrigation water resources.

Goal R7 - Priority High

Objective R7.1 Meet current and future water needs of the community
Action: Develop additional source and storage as well as implement conservation plans
Time Frame: Ongoing
Funding: State and Fedearl grants/loans, County funds
Estimated Cost: To be determined
Staff: Water districts, County, State, Contractors
Background: Garfield County has experienced several years of drought conditions. To meet the needs of the community's residential and business water users, vigilance is locating new and additional sources as well as increasing storage capacity to meet current needs as well as future need is a must.

Objective R7.2 Conserve culinary water by conservation
Action: Maintain and enforce rate policies that encourage water conservation
Time Frame: Ongoing
Funding: State grants, County funds
Estimated Cost: Minimal
Staff: Water districts, County, State

Background: Evaluate the use of a tiered water rate structure.

Iron County

Problem Identification: Assessment of range and pasture conditions in Iron County for the 2002/2003 growing season, simply put they were the worst in recorded history. Data shows that we only received 20-30 percent of our normal precipitation; this is characterized as exceptional drought. Range and pasture have been impacted by lack of precipitation. Growing conditions have been so poor many ranges produced no useable forage. There has been mortality of sagebrush and juniper trees due to the drought with conditions so dry in the spring even the cheatgrass did not grow.

Goal R8 - Priority Medium

Objective R8.1 It will take many years of above average precipitation to make up for the many years of drought we have experienced. Estimates of overall pasture and range conditions is about 60% of normal. Conditions are extremely variable depending on what area of the county you are looking at. Any precipitation received in September 2003 was very random in distribution and did not make much of an impact on the overall drought.
Action: Many studies have been done and we are involved in a drought cycle. We are supposedly in the downhill side of the cycle. Hopefully, things will start to get back to normal and improve the drought situation.

Time Frame: On going
Funding: unknown
Estimated Cost: Could cost farmers/livestock many dollars. Some may even face bankruptcy.
Staff: unknown
Background: Studies done over the generations of time. History records show this to be the worst drought ever seen in Iron County. Need to keep an eye on underground water levels, seeps and springs to see if there will be enough for livestock and agricultural use in the future.

Washington County

Enterprise

Problem Identification: Cyclical periods of drought place a strain on community culinary water resources.

Goal R9 - Priority High

Objective R9.1 Conserve culinary water
Action: Educate the public on the need to be water wise

Time Frame: Ongoing
Funding: City funds
Estimated Cost: minimal
Staff: Water purveyor and newsletter editor
Background: Use a newsletter to educate the public

Action: Maintain and enforce rate policies that encourage water conservation

Time Frame: Ongoing
Funding: City funds
Estimated Cost: minimal
Staff: Water purveyor and newsletter editor
Background: The City should continue to maintain and implement a tiered water rate structure.

Hurricane

Problem Identification: Cyclical periods of drought place a strain on availability of community culinary water and irrigation water resources.

Goal R10 - Priority High

Objective R10.1 Meet current and future water needs of community
Action: Develop additional source and storage as well as implementing conservation plans
Time Frame: Ongoing
Funding: City funds, State and Federal Government loans and/or grants
Estimated Cost: To be determined
Staff: Hurricane City Staff, Professional Services, Contractors
Background: Hurricane is in a desert climate and has experienced several years of drought conditions. To meet the needs of the community's residential and business water users, vigilance in locating new and additional sources as well as increasing storage capacity to meet current needs as well as future need is a must.

LaVerkin

Problem Identification: Limited water supplies, increasing population and several years of drought place a strain on availability of community culinary water resources.

Goal R11 - Priority High

Objective R11.1 Meet current and future water needs of community
Action: Develop additional source and storage as well as provide ongoing plans and education.
Time Frame: Ongoing
Funding: City funds and possible grants
Estimated Cost: To be determined
Staff: Water and Public Works Departments
Background: LaVerkin has experienced several years of drought conditions. Source supply and storage need to keep pace with population growth. An education program needs to be implemented to educate water users on methods to conserve available water resources.

Rockville

Problem Identification: Currently the Rockville Ditch and Pipeline Companies provide water to most areas of town. Because of its design, the system is not as efficient as it could be.

Goal R12 – Priority High

Objective R12.1 Conserve irrigation water by improving the area of irrigation water delivery and efficiency.
Action: Determine how the irrigation delivery system could be improved to provide comprehensive service as well as more efficient means of delivery.

Time Frame: Ongoing
Funding: Private irrigation companies
Estimated Cost: To be determined
Staff: Irrigation water purveyor
Background: Rockville has experienced several years of drought conditions. The distribution of irrigation water in Rockville is by a combination or open ditches and non pressurized pipe. Not all properties in town can utilize this. A pressurized system is a consideration, however the cost of such a system may be high.

Problem Identification: Currently the Rockville Ditch and Pipeline Companies provide water to most areas of town. Because of its design, the system is not as efficient as it could be.

Goal R13 – Priority Moderate

Objective R13.1 Conserve culinary water through education and continued water conservation policies.
Action: Continue the practice of providing written educational materials with water bills and educational materials at the post Office/Community Center, etc

Time Frame: Ongoing
Funding: Private irrigation companies
Estimated Cost: To be determined
Staff: Irrigation water purveyor
Background: A continued program of providing education on methods of water conservation will help ensure adequate supply of culinary water.

St. George

Problem Identification: Limited water supplies, increasing population and several years of drought place a strain on availability of community culinary water resources.

Goal R14 - Priority High

Objective R14.1 Excessive water used for landscaping
Action: Develop and enforce policies to limit the amount of area that can be used as water requiring landscape.

Time Frame: Ongoing
Funding: none
Estimated Cost: To be determined
Staff: City Planning Staff
Background: St. George City removed water requiring landscape from around the City office building and replaced it with water conserving desert landscape. This should be encouraged throughout the city where appropriate.

Toquerville

Problem Identification: Limited water supplies during the extended years of drought have placed a strain on availability of community culinary water resources.

Goal R15 – Priority High

Objective R15.1 Reduce use of culinary water
Action: Continue to enforce policies to reduce water usage.
Time Frame: Ongoing
Funding: none
Estimated Cost: none
Staff: City staff
Background: In 2003, Toquerville implemented a mandatory even/odd day watering schedule between June 1st and October 31st .

Washington City

Problem Identification: Community is suffering, as is all of southwestern Utah through and extended, severe drought.

Goal R16 – Priority High

Objective R16.1 Conserve water resources.
Action: Enforce existing City water conservation ordinance.
Time Frame: On-going
Funding: N/A
Estimated Cost: N/A
Staff: Washington City Public Works Department
Background: The City has already adopted a water conservation ordinance.

Action: Adopt a time-of-day outdoor watering ordinance.
Time Frame: Spring 2004
Funding: N/A
Estimated Cost: N/A
Staff: Washington City Public Works Department
Background: The existing water conservation ordinance does not include provisions for designated times in which outdoor watering should take place.

Action: Create new water sources.
Time Frame: 20 years
Funding: Bonding/City
Estimated Cost: $1,000,000 or more
Staff: Washington City Public Works Department/Consultants
Background: The City needs to identify new water resources for its increasing population and to better plan for future periods of drought. Difficulties may be that some citizens do not approve of the City committing to additional bonding.

Problem Soils

Region-wide Mitigation

Problem Identification: Wind Erosion

Goal R17 - Priority Medium

Objective R17.1 Reduce damage to crops and structures.
Action: Improve conditions to reduce soil erosion.

> **Time Frame:** Ongoing
> **Funding:** U.S. Department of Agriculture government programs.
> **Estimated Cost:** Unknown
> **Staff:** Natural Resources Conservation Service (NRCS), Utah Association of Conservation Districts (UACD)
> **Background:** Encourage people to sign up for help

County-specific Mitigation

Washington County

Hurricane

Problem Identification: South Fields area has collapsible soils.

Goal R18 – Priority High

Objective R18.1 Lessen the risk to buildings from collapsible soils
Action: Require soils testing prior to building and following engineer's requirements

> **Time Frame:** Ongoing
> **Funding:** Local Government and possible grants
> **Estimated Cost:** To be determined
> **Staff:** Building Department, City Engineer, Public Works
> **Background:** The South Fields area of the community is located on a dry lake bed. Sink holes have developed in areas where no testing and mitigation has been completed.

Rockville

Problem Identification: The Rockville Sensitive Lands Overlay Map has identified problem areas such as slopes, flood plains and wetlands.

Goal R19 – Priority High

Objective R19.1 Lessen the risk to buildings from problem soils
Action: Restrict building in areas identified as having problem soils

> **Time Frame:** Ongoing
> **Funding:** Town funds
> **Estimated Cost:** minimal
> **Staff:** Town, Engineering Consultant

Background: The overlay map identifies likely problem areas. Site specific studies would identify risks and issues specific to a given parcel.

Action: Maintain land use code chapters dealing with sensitive lands

Time Frame: Ongoing

Funding: Town funds

Estimated Cost: minimal

Background: The town has codes on the books. These need to be enforced and amended as needed.

Washington City

Problem Identification: Expansive soils are found throughout the City.

Goal R20 – Priority High

Objective R20.1 Reduce potential building foundation settling risks.

Action: Enforce existing City ordinances requiring geotechnical studies and require recommended mitigation measures from studies.

Time Frame: On-going

Funding: Developers

Estimated Cost: case by case

Staff: Developer's consultant's with review by Washington City Public Works and Community Development departments.

Background: All developments require geotechnical studies to ensure stable foundations for buildings. There are many areas of expansive soils throughout the City.

<u>Severe Weather</u>

County-specific Mitigation

Beaver County

County-wide

Problem Identification: Wind damage to property and resulting loss of power to facilities in the Milford and Beaver valleys.

Goal R21- Priority High

Objective R21.1 - Reduce power outages.

Action: Improve infrastructures to minimize power outages.

Time Frame: Ongoing

Funding: Multiple groups.

Estimated Cost: Unknown

Staff: Private people and local utilities.

Background: Contact utilities on current situation. Gather data on power outage, and frequency of outages.

Objective R21.2 - Reduce damage to power lines from trees and limbs that blow down in severe wind storms
Action: Decrease the number of trees which have limbs growing around power lines
Time Frame: Ongoing
Funding: Local
Estimated Cost: Unknown
Staff: Local Utilities
Background: Identify trees which pose a problem, remove or trim trees that are a threat to power lines

Milford

Problem Identification: Wind damage to crops and structures in the Milford valley.

Goal R22- Priority

Objective R22.1 - Reduce damage to crops and structures.
Action: Improve conditions to reduce soil erosion.
Time Frame: Ongoing
Funding: USDA government programs.
Estimated Cost: Unknown
Staff: NRCS, UACD
Background: Encourage people to sign up for help

Garfield County

County-wide

Problem: Snowstorms, summer thunderstorms, flash floods, hail, and high winds over central Utah have a dramatic effect on regional commerce, transportation, and daily activity and are a major forecast challenge for local meteorologists

Goal R23 – Priority High

Objective R23.1 Protect County from adverse affects of severe weather
Action: County participation in the StormReady program.
Time Frame: 2 Year
Funding: State and Federal
Estimated Cost: Unknown
Staff: City and County Emergency Management
Background: Set up within the county emergency management and encourage all cities to participate, all requirements of the National Weather Service StormReady program.

Action: Encourage avalanche preparedness for county backcountry users.

Time Frame: 1 Year
Funding: Minimal
Estimated Cost: Minimal
Staff: County Emergency Management State Hazard Mitigation Team members, Utah Avalanche Forecast Center.
Jurisdictions: Countywide
Background: Avalanches and avalanche preparedness is not often considered when discussing mitigation on the county or city level, yet several people die each year in Utah's backcountry. While the avalanche terrain is mainly on US Forest Service land the search and rescue for the lost individual in more often than not coordinated by emergency managers with search parties comprised of county and city staff. Introductory avalanche awareness training could lessen the costs to Sanpete County and the cities within the county. Most avalanche victims die in avalanches started by themselves or someone in there party. Thus, education can limit the number of avalanche related searches each year.

Action: Assess EOCs to ensure they are grounded lightning, to include buildings with towers, etc.

Time frame: 2-3 years
Funding: Federal Grants
Estimated Cost: Unknown
Staff: County Emergency Management
Jurisdictions: Countywide
Background: Alternate EOCs, Sheriff's Dispatch, Command Vehicle(s)and associated equipment need to be protected from severe weather events including lightning.

Washington County

Enterprise

Problem Identification: Enterprise experiences occasional, damaging high winds.

Goal R24 – Priority High

Objective R24.1 Reduce damage to structures through strict adherence to building codes
Action: Ensure that 80 MPH wind load requirement is met by builders

Time Frame: Ongoing
Funding: Building permit fees
Estimated Cost: Minimal
Staff: Building Inspector
Background: Adherence to building code requirement for tying roof structures to supporting walls will minimize damage from high wind events

Hurricane

Problem Identification: Power lines are at risk from seasonal high winds.

Goal R25 – Priority High

Objective R25.1 Reduce service disruptions and damage to power lines
Action: Provide adequate clearances for power lines and conduct ongoing line maintenance. Maintain outage plan.

Time Frame: Ongoing
Funding: Hurricane City Power, Possible Grants
Estimated Cost: To be determined
Staff: Hurricane City Power, 138 Task Force
Background: Extreme winds have occurred, utilities disruption has occurred in past years due to damage to power poles and transmission lines by high winds.

LaVerkin

Problem Identification: Power lines are at risk from seasonal high winds.

Goal R26 – Priority High

Objective R26.1 Provide adequate clearances for power lines
Action: Conduct regular line maintenance.

Time Frame: Ongoing
Funding: Local government and possible grants
Estimated Cost: To be determined
Staff: Water and Public Works Departments
Background: Occasional severe seasonal winds pose risk of damage to power poles and transmission lines by high winds.

New Harmony

Problem Identification: Periodic severe thunderstorms and occasional periods of rain over several days cause flooding. Severe windstorms and occasional hailstorms cause structural damage.

Goal R27 – Priority High

Objective R27.1 Reduce structural damage from windstorms, occasional hailstorms.
Action: Assure adherence to building codes.

Time Frame: Ongoing
Funding: Building Permit Fees
Estimated Cost: Minimal, by builder
Staff: County Building Department
Background: Due to its geographic location the town is subject to occasional severe windstorms and thunderstorm activity with associated hail.

St. George

Problem Identification: Strong winds can cause trees to fall on power lines, causing power outages

Goal R28 – Priority High

Objective R28.1 Improve electrical power system reliability by reducing risk from damage by trees falling in windstorms.
Action: Prune trees back from power lines.
Time Frame: 3 year plan
Funding: City Power Department
Estimated Cost: Not determined, minimal to moderate
Staff: City Power Department
Background: Due to its geographic location the town is subject to occasional severe windstorms and thunderstorm activity with associated hail.

Problem Identification: Occasional heavy rains bring problems with flooding

Goal R29 – Priority Medium

Objective R25.1 Improved public awareness about flood hazards in the community.
Action: Prepare educational materials and presentations about "100 year flood events" that occur in the area. Distribute this information and/or conduct educational programs for the public.
Time Frame: 2 years
Funding: City/FEMA/Army Corps of Engineers
Estimated Cost: Minimal
Staff: Can be done through the CERT program
Background: Most people are not aware of what the term "100 year flood event" or building in a100 year flood zone really means.

Virgin

Problem Identification: Power lines are at risk from seasonal high winds.

Goal R30 – Priority High

Objective R30.1 Reduce service disruptions and damage to power lines
Action: Ensure that adequate clearance for power lines is provided and conduct ongoing line maintenance through Utah Power.
Time Frame: Ongoing
Funding: Commercial power provider
Estimated Cost: To be determined
Staff: Utah Power employees
Background: Occasional strong winds have caused utilities disruption due to damage to power poles and transmission lines by high winds.

Insect Infestation

County-specific Mitigation

Beaver County

Problem Identification: Heavy infestations of Mormon crickets and grasshoppers south of Minersville, Bald Ridges, North of Beaver and in the Mineral Ranges.

Goal R31- Priority Medium

Objective R31.1 Have government agencies develop better control methods on federal grounds.
Action: Improve control methods on private and federal grounds.
- **Time Frame:** 5 years
- **Funding:** Federal government.
- **Estimated Cost:** Unknown
- **Staff:** APHIS, BLM and other federal and state agencies.
- **Background:** Educate private and federal landowners on control methods and more into their lifecycles.

Action: Eradicate crickets and grasshoppers.
- **Time Frame:** Ongoing.
- **Funding:** Federal government.
- **Estimated Cost:** Unknown
- **Staff:** APHIS, BLM and other federal and state agencies.

Garfield County

Problem Identification: Western Garfield County is occasionally vulnerable to Mormon Cricket and Cutworm infestations as well as some mosquito problems

Goal R32 – Priority Low

Objective R32.1 Reduce the impact of insects
Action: Spread insect bait and spray for mosquitos
- **Time Frame:** When required
- **Funding:** City and County funds, abatement taxes
- **Estimated Cost:** Approximately $3.00/property owner/month
- **Staff:** County Mosquito Abatement District
- **Background:** Insect infestation impacts agriculture as well as communities

Iron County

Problem Identification: Grasshoppers and Mormon Crickets are present every year in Iron County. Most years grasshoppers are an economic pest in the New Harmony Flats area and on Cedar Mountain. Mormon Crickets have been especially bad in 2003, they were reported in the Urie Creek area of Cedar Mountain. There was also a severe grasshopper infestation. 2002-2003 seems to have been especially bad for grasshoppers with reports of them eating landscaping, vinyl screens on windows and even eating the handle grips of bicycles laid down in the grass.

Goal R33- Priority Medium

Objective R33.1 The best thing would be to totally get rid of the problem. However, that will never happen. Our objective is to learn to control the insects by trying different types of insecticides.
Action: Cut grasses short near homes

Time Frame: Yearly, on going
Funding: U. S. Department of Agriculture, Iron County
Estimated Cost: $5,000.00
Staff: Landowners, farmers, County Agents
Background: Something that has taken place in and around Southwestern Utah for decades. Our pioneer heritage even notes these infestations happening back then. Keeping grasses mowed short near homes would help keep some of the infestation away from subdivisions. Trying to control them has been difficult in the past due to problems with the endangered species act. There has been use of Dimilin in some of the harder hit areas of Iron County and it has proven to reduce the grasshopper populations in the areas that have been treated.

Kane County

Problem Identification: Lack of public knowledge on insect infestation problems.

Goal R34 – Priority Medium

Objective R34.1 To increase the level of awareness for the residents of Kane County.
Action: Conduct a Countywide community awareness campaign
Estimated Cost: $10,000.00
Time Frame: 2 to 5 years
Funding: Public Funds
Staff: Emergency Services Personnel.
Background: The citizens of Kane County need to be made aware of insect infestation issues that may affect their area. Through a public awareness program such as on Africanized bees, general individual preparedness will be improved.

Washington County

Enterprise

Problem Identification: South and west sides of the City are occasionally vulnerable to Mormon Cricket and Cutworm infestations as well as some mosquito problems.

Goal R35 – Priority High

Objective R35.1 Reduce the impact of insects
Action: Spread insect bait and spray for mosquitoes
Time Frame: When required
Funding: City and County funds. Mosquito abatement funds come from property tax.
Estimated Cost: Approximately $3.00 per property owner per month
Staff: County Mosquito Abatement District
Background:

New Harmony

Problem Identification: Periodic Grasshopper infestations more sever on edge of developed town area and in field surrounding town.

Goal R36 – Priority High

Objective R36.1 Reduce the severity of infestations

Action: Conduct aerial spraying to reduce infestations
Time Frame: As infestations occur
Funding: By private individuals in most cases
Estimated Cost: Varies, depending on acreage treated
Staff: Contractor
Background: New Harmony is surrounded by many agricultural fields. These have been subjected to insect infestation especially during the recent years of drought.

<u>Radon Gas</u>

County-specific Mitigation

Iron

Problem Identification: The United States Geological Survey has evaluated the potential for radon gas within the boundaries of Iron County as low, less than 2 pCi/L to moderate, 2 to 4 pCi/L. The EPA recommends that all homes that measure 4 pCi/L and greater be mitigated. Radon Gas is a naturally occurring, chemically inert, radioactive gas that is not detectable by human senses. As a gas, it can move readily through particles of soil and rock, and can accumulate under the slabs and foundations of homes where it can easily enter into the living space through construction cracks and openings.

Goal R37 – Priority Medium

Objective R37.1 Try to identify the areas that would be most susceptible to this problem and restricting building in these potential problem areas.
Action: Try to identify the areas in the county that would have this problem.
Homes that are already built in problem areas could possibly be fixed so that radon gas is not a problem to the owners.

Time Frame: Best done at time of construction. Possible to retrofit.
Funding: Property owner/homeowners expense
Estimated Cost: $400.00
Staff: County Building Department for advise.
Background: Contact your local building department/contractor

Beaver County

<u>Wildfire</u>

County-wide

Problem Identification: Continuing non-compliance with existing building and fire codes.

Goal B1-Priority High

Objective B1.1 - Increase compliance with existing building and fire codes.
Action: Develop and enforce current local, state and national codes.
Time Frame: Ongoing
Funding: Local state and federal grants
Estimated Cost: Unknown
Staff: Local state and federal agencies
Background: Implement and enforce rules, regulations and codes.

Problem Identification: Specific areas of the county are susceptible to wildland fire danger.

Goal B2- Priority Medium

Objective B2.1 - Reduce the threat of Wildfire in Elk Meadows, Whispering Pines and HiLo subdivision areas.
Action: Complete community fire plans for each of these areas
Time Frame: next fiscal year
Funding: Local
Estimated Cost: Minimal
Staff: Local state and federal agencies
Background: Contact Keith Parke (Five County Fire Planner)

Beaver City

Problem Identification: Specific areas of the Grove in the county/city area are susceptible to wildland fire danger.

Goal B3- Priority Medium

Objective B3.1 - Reduce the threat of Wildfire in The Grove area
Action: Complete community fire plans for the Grove
Time Frame: next fiscal year
Funding: Local
Estimated Cost: Minimal
Staff: Local state and federal agencies
Background: Contact Keith Parke (Five County Fire Planner)

Landslide

County-wide

Problem Identification: Potential landslides around upper elevations mostly by Kents Lake and Elk Meadow. Possibility of east Hwy 153 being washed out, stream damned up, etc.

Goal B4 - Medium

Objective B4.1 - Reduce landslide impact on Hwy 153, east of Beaver.
Action: Determine hazard according to UDOT.
- **Time Frame:** According to UDOT.
- **Funding:** According to UDOT funding.
- **Estimated Cost:** Undetermined
- **Staff:** Undetermined
- **Background:** Hazard will be referred to UDOT.

Problem Identification: Potential risk of structures in mountainous areas to be damaged by landslides.

Goal B5 - Medium

Objective B5.1 - Reduce potential landslide risk on commercial and residential structures on upper elevations.
Action: Assessing possibility of landslides.
- **Time Frame:** Undetermined
- **Funding:** Property owner
- **Estimated Cost:** Unknown
- **Staff:** Unknown
- **Background:** Soil surveys and other engineer surveys.

Flood

County-wide

Problem Identification: There is not enough flood information on flood areas in Beaver County to identify the problem at this time.

Goal B6 – Priority High

Objective B6.1 - Identify flood prone areas in County.
Action: Mapping of potential flood areas.
- **Time Frame:** Unknown
- **Funding:** Undetermined
- **Estimated Cost:** Undetermined
- **Staff:** State and FEMA personnel.
- **Background:** Contact DESHS flood map specialist.

Beaver City

Problem Identification: The Beaver River floods between the Grove area and Highway 160

Goal B7-Priority Medium

Objective B7.1 - Reduce flooding along the Beaver River between the Grove and Highway 160
Action: Alleviate obstructions to Beaver River
Time Frame: 1-2 years
Funding: City
Estimated Cost: $5,000.00
Staff: City
Background: Clean the riverbed of trees and undergrowth

Milford

Problem Identification: The area on the eastern boundary of Milford in the Industrial Park has flooded periodically which can impact some farms, Circle 4 Farms and Basin Perlite

Goal B8-Priority Medium

Objective B8.1 To impound
Action: To impound flood waters if and when it leaves the river prior to reaching Milford to help recharge the
Time Frame: 5 years
Funding: Local
Estimated Cost:
Staff: Local, UACD
Background:

Minersville

Problem Identification: Possible Impact from flooding due to a seismic event that could cause failure of Rocky Ford Irrigation Dam (Minersville Reservoir)-**Multi hazard event**

Goal B9- Priority High

Objective B9.1 - To reduce flooding impact of a Minersville Dam failure due to a seismic event.
Action: .Identify areas of inundation from possible failure of the Rocky Ford Irrigation Dam (Minersville Reservoir)
Time Frame: Next funding year
Funding: FEMA, state and local.
Estimated Cost: Minimal
Staff: AOG/state
Background: Contact state GIS center (AGRC) to request a mapping study with assistance from the Five County Association of Governments

Problem Identification: There has been an ongoing flooding problem along Center Street within town boundaries that threatens 4 homes and 1 business

Goal B10- Priority High

Objective B10.1 - To reduce reoccurring flooding problems along a 2½ block section of Center Street.
Action: Retain flood waters in the street
Time Frame: 1-5 years
Funding: FEMA, state and local.
Estimated Cost: $10,000.00
Staff: Town staff
Background: Install a drainage line along Center Street

Earthquake

County-wide

Problem Identification: Unknown number of seismically unsafe structures around the county.

Goal B11- Priority High

Objective B11.1 - Have a study done to determine seismic resistance of specific structures within the county ie. elementary and high schools, hospitals, public buildings, high traffic areas, etc.
Action: Structural and non-structural earthquake hazard assessment.
Time Frame: Ongoing
Funding: Unknown
Estimated Cost: Unknown
Staff: Unknown
Background: Contact DESHS earthquake program specialist.

Objective B11.2 - Public Awareness
Action: Conduct pubic awareness campaign.
Time Frame: Ongoing
Funding: Federal and state grants, local sources.
Estimated Cost: Unknown
Staff: Agency personnel and volunteers.
Background: Contact DESHS earthquake program specialist. Enhance earthquake instructions in school.

Objective B11.3 - Better community response to emergency situations
Action: Organize Community Emergency Response Teams.
Time Frame: Ongoing
Funding: Federal and State grants.
Estimated Cost: $2000 for course.
Staff: State and local personnel.
Background: Contact the Regional Citizens Corp. Council.

Beaver City

Problem Identification: Cast iron water pipes in 200 North on the West side of town break after a small seismic event.

Goal B12- Priority High

Objective B12.1 - Reduce the likelihood of pipe failure due to small tremors
Action: Upgrade the quality of water pipes in specific areas
Time Frame: 1-5 years
Funding: City
Estimated Cost: $75,000.00
Staff: City
Background: Replace existing cast iron pipes, install new bedding materials, install PVC pipe

Milford

Problem Identification: Old city water lines at 200 West 600 South to 600 North break due to seismic events

Goal B13-Priority High

Objective B13.1 To maintain continuous water service to all areas of Milford
Action: Upgrade water pipes along 200 West
Time Frame: 1-3 years
Funding: CIB or other grants
Estimated Cost: unknown
Staff: City staff
Background: Replace existing cast iron pipes, install new bedding materials, install PVC pipe

Minersville

Problem Identification: During small seismic events caste iron water pipes along 200 west break causing an interruption in service of culinary water to residents

Goal B14-Priority High

Objective B14.1 To maintain continuous water service to all areas of Milford
Action: Upgrade water pipes along 200 West
Time Frame: 1-3 years
Funding: CIB or other grants
Estimated Cost: unknown
Staff: City staff
Background: Replace existing cast iron pipes, install new bedding materials, install PVC pipe

Garfield County

<u>Wildfire</u>

County-wide

Problem Identification: Continuing non-compliance with existing building codes and fire codes.

Goal G1 - Priority High

Objective G1.1 Increase compliance with existing building ad fire codes
Action: Develop and enforce current local, state and national codes

> **Time Frame:** Ongoing
> **Funding:** Local, State and Federal grants
> **Estimated Cost:** Unknown
> **Staff:** Local, State and Federal agencies
> **Background:** Implement and enforce rule, regulations and codes

Panguitch

Problem Identification: Approximately 20 homes are at risk from wildfire

Goal G2 - Priority High

Objective G2.1 Educate homeowners on how to reduce risk of wildfire damage
Action: Conduct an education program on reducing wildfire risks

> **Time Frame:** Ongoing
> **Funding:** City and County
> **Estimated Cost:** Minimal
> **Staff:** Fire Chief and State Fire Warden
> **Background:** Educate homeowners using newsletters and personal contacts of importance of clearing combustibles from perimeters of their homes

Hatch

Problem Identification: Fire is a threat to power facilities and transmission lines

Goal G3 - Priority High

Objective G3.1 Reduce threat of utilities interruption due to wildland fire
Action: Safeguard facilities and poles

> **Time Frame:** Ongoing
> **Funding:** Local
> **Estimated Cost:** Undetermined
> **Staff:** Task Force
> **Background:** Power and telephone transmission lines in Hatch travel via overhead lines through many developed and undeveloped areas. A wildland fire could disrupt

services to customers by igniting poles or arcing. Facilities and transmission lines need to be evaluated and plans implemented to safeguard facilities and poles. Plans must be developed it isolate affected areas and maintain services to customers.

Tropic

Problem Identification: Wildfire is a threat to the west and south side of the City

Goal G4 - Priority High

Objective G4.1 Reduce threat of damage to a wildland fire
Action: Conduct an education program on reducing wildfire risks
Time Frame: Ongoing
Funding: City and County
Estimated Cost: Minimal
Staff: Fire Chief and State Fire Warden
Background: Educate homeowners using newsletters and personal contacts of the importance of clearing combustibles from perimeters of their homes

Cannonville

Problem Identification: Wildire is a threat to the community

Goal G5 - Priority High

Objective G5.1 Reduce threat of damage due to a wildland fire
Action: Educate the residents of the community on how to make their properties fire safe
Time Frame: Periodic
Funding: City and County
Estimated Cost: Minimal to Town
Staff: Town Staff, County Fire
Background: Educate homeowners using newsletters and personal contacts of the importance of clearing combustibles from perimeters of their homes.

Henrieville

Problem Identification: Wildfire is a threat due to grasslands drying out during extending dry periods.

Goal G6 - Priority High

Objective G6.1 Reduce threat of damage due to a wildland fire
Action: Educate residents of the value of maintaining firebreaks around their homes
Time Frame: Periodic
Funding: Local
Estimated Cost: Minimal
Staff: City and County
Background: During extended dry periods the grasslands dry out and represent a potential fire hazard

Escalante

Problem Identification: Wildfire is a threat due to grasslands drying out during extended dry periods.

Goal G7 - Priority High

Objective G7.1 Reduce threat of damage due to a wildland fire
Action: Thin or remove vegetation causing exposure problem
- **Time Frame:** 1 year
- **Funding:** Moderate, no local funds
- **Estimated Cost:** Moderate
- **Staff:** City and County
- **Background:** During extended dry periods the grasslands dry out and represent a potential fire hazard

Boulder/Antimony

Problem Identification: Power facilities and telephone poles are at greatest risk from wildfire.

Goal G8 - Priority High

Objective G8.1 Reduce threat of damage due to a wildland fire
Action: Thin vegetation along river or create a fire break to protect nearby facilities
- **Time Frame:** Ongoing
- **Funding:** Moderate, local funds
- **Estimated Cost:** Moderate
- **Staff:** County and Cities
- **Background:** The dense Boulder Creek bottom cover provides an ideal location for a wildfire. To reduce or eliminate exposure to structures, redundant communications systems should be installed to provide necessary coverage.

Landslide

County-Wide

Problem Identification: There is a potential risk to structures located in areas identified in the FCAOG GIS as landslide risk areas

Goal G9 - Priority Medium

Objective G9.1 Reduce potential landslide risk on commercial and residential structures in areas of known landslide potential
Action: Assess the probability of landslides and identify specific structures at risk
- **Time Frame:** Undetermined
- **Funding:** Property Owner
- **Estimated Cost:** Unknown
- **Staff:** Unknown
- **Background:** Soil surveys and other engineering surveys are needed.

Problem Identification: There is a low risk, but potential for landslide or land movement to impact water supply systems.

Goal G10 - Priority Medium

Objective G10.1 Provide for a second means of supplying culinary water to residents within Cities and Towns of Garfield County
Action: Establish and maintain a means to readily connect the City's and Town;s culinary water users to alternative water sources.

> **Time Frame:** Undetermined
> **Funding:** Local governments and possible grants and loans
> **Estimated Cost:** To be determined
> **Staff:** Panguitch City
> **Background:** In case City/Town's water supply is damaged, the communities would need to connect to emergency means. Use of water would need to be curtailed to essential services only.

Flood

County-Wide

Problem Identification: Control flooding in unincorporated residential areas of Garfield County. Flooding occurs from heavy rains and fast moving thunderstorms.

Goal G11 - Priority High

Objective G11.1 Obtain aerial photography with contours for identified residential areas in Garfield County to assist in flood risk identification.
Action: Set horizontal and vertical survey control and order aerial photography with contours for each identified residential area in the County

> **Time Frame:** 3 months to 2 years, depending on number in areas
> **Funding:** Local, State and Federal grants
> **Estimated Cost:** $700 per residential area, depending on size
> **Staff:** County staff and Contractor
> **Background:** Aerial photography is needed in the development of Master Storm Drainage design.

Objective G11.2 Design Master Storm Drainage Plans for residential areas in the County
Action: Design Master Storm Drainage Plan to handle storm water runoff

> **Time Frame:** 3 months to 2 years, depending on number of areas worked on
> **Funding:** Grants
> **Estimated Costs:** $10,000 per residential area, depending on size
> **Staff:** County Staff and Contractor
> **Background:** Engineers design Master Storm Drainage Plans for residential areas for flooding.

Objective G11.3 Develop a comprehensive storm drainage plan for Garfield County
Action: Implement storm drainage plans throughout the residential areas of Garfield County

> **Time Frame:** 3 years plus, as soon as Plans are completed
> **Funding:** State and Federal grants

Estimated Cost: Unknown, will depend on final plans and requirement of facilities and structures.
Staff: County and Contractor
Background: Construct storm drainage facilities and require all new developments to meet County storm drainage plan(s)

Problem Identification: Control flooding in unincorporated residential areas of Garfield County. Flooding occurs from heavy rains and fast moving thunderstorms.

Goal G12 - Priority Medium

Objective G12.1 Implement storm drainage plans through out residential areas of Garfield County.
Action: Implement storm drainage plans throughout the residential areas of Garfield County
Time Frame: 2 years
Funding: State and Federal grants
Estimated Cost: Unknown, will depend on final plans and what facilities are required
Staff: City and Contractor
Background: Construct storm drainage facilities and require all new developments to meet County storm drainage plan(s).

Problem Identification: Flood insurance is not promoted actively promoted in the County.

Goal G13 - Priority High

Objective G13.1 Encourage 100% participation in the National Flood Insurance Program (NFIP).
Action: Assist Town of Antimony in joining NFIP
Time Frame: 1 year
Funding: None required
Estimated Cost: None
Staff: County Emergency Management, County Floodplain Administrator, State Floodplain Manager
Background: The Town of Antimony has mapped Special Flood Hazard Areas (SFHAs), but does not participate in the NFIP. Flood insurance is not available in the community

Objective G13.2 Promote flood insurance throughout the County
Action: Create outreach document promoting flood insurance and include in local newspaper(s), libraries, and other public buildings.
Time Frame: 1 year
Funding: Minimal
Estimated Cost: Unknown
Staff: County Floodplain Administrator, State Floodplain Manager, DES
Background: General public is usual not aware they can purchase flood insurance.

Earthquake

County-wide

Problem Identification: Transportation and utilities services could be severely impacted by an earthquake affecting emergency response and relief activities

Goal G14 - Priority Medium

Objective G14.1 Provide for emergency response and relief
Action: Identify and maintain critical transportation and utility services
Time Frame: Ongoing
Funding: Local governments and possible grants
Estimated Cost: Unknown
Staff: County Public Works, County Emergency Management, UDOT, Utilities
Background: Critical transportation and utility systems need to be maintained

Problem Identification: There is a high probability of rockfall caused by seismic events and possible liquefaction along river systems.

Goal G15 - Priority Medium

Objective G15.1 Raise awareness of problems and risk associated with earthquakes
Action: Maintain adherence to Land Use Codes and restriction to building in identified sensitive areas
Time Frame: Immediate and ongoing
Funding: None
Estimated Cost: None
Staff: County, City and Town Building Officials and staff
Background: Problem associated with falling rocks can be identified in areas along Paria River, Escalante River, Calf Creek, Boulder Creek.

Problem Identification: Damage to residential structures and public facilities is likely during a seismic event

Goal G16 - Priority Medium

Objective G16.1 Reduce threat to public safety during an earthquake
Action: Retrofit inadequate construction
Time Frame: Long term
Funding: Private
Estimated Cost: Expensive
Staff: County, City and Town Building Officials and Engineers, Contractors
Background: Old inadequate construction in buildings, un-reinforced masonry, should be mitigated.

Problem Identification: Lack of public awareness about earthquake damage prevention practices

Goal G17 - Priority Medium

Objective G17.1 Educate community on earthquake damage prevention practices
Action: Produce and/or distribute handouts and provide inspections to identify shortcomings in earthquake preparedness

Time Frame: 2 year
Funding: Unknown, possible grants
Estimated Cost: Unknown
Staff: County Emergency Management, DES
Background: Having a community educated on earthquake damage prevention practices will ensure greater safety for its residents.

Objective G17.2 Educate community on disaster preparedness and response
Action: Continue to support CERT Programs

Time Frame: 2 year
Funding: State and Federal grants
Estimated Cost: $25,000
Staff: County Emergency Management, DES
Background: CERT is proactive measure to educate public on earthquake hazard and community response to an event.

Iron County

Wildfire

County-wide

Problem Identification: Iron County has a Moderate to Severe wildfire risk throughout the county. Areas of high concern are as follows:

Brian Head
Parowan Front
Iron Town
Comstock/Far West
Cedar Highlands
And other communities identified through hazard analysis

Goal I1 - Priority High

Objective I1.1 -Reduce the risk of Wildland Fire throughout Iron County
Action: Create community fire safe councils and implement the “Community Fire Planning” process.

Time Frame: On going
Funding: Obtain grant monies and alternative sources of funding through various grants and foundation.
Estimated Cost: $5,000.00 per plan
Staff: Unknown
Background: The “Community Fire Planning” process was implemented through the Utah Division of Forestry, Fire, and State Lands in support of on-going efforts under the National Fire Plan to educate and empower landowners to take action to reduce the threat of wildfires within a community.

Action: Implement fuel modification projects

Time Frame: On going
Funding: Grants and private landowners
Estimated Cost: Variable based on acreage and type of materialsbeing removed.
Staff: State, County, Cities, Towns and residents
Background: Through the creation of defensible space in and around communities, the threat of catastrophic wildfires will be greatly reduced.

Action: To educate and inform the community of fire prevention

Time Frame: Immediate and on going
Funding:
Estimated Cost: $5,000.00 per year
Staff: County Planning and Zoning, Building Department, Fire Warden
Background: Education is the key to informing homeowners about the risk of wildfires. Through a comprehensive education, program homeowners can take action independent to protect values at risk, and understand the effects of wildfires.

Brian Head

Problem Identification: Brian Head Town is surrounded by federal and private lands that have suffered a severe beetle infestation. Fuel loading is 20 to 30 tons per acre and needs to be cleaned up to lessen the effects of a wildland fire on this community.

Goal I2 - Priority High

Objective I2.1-Minimize the damage of a wildland fire and provide the appropriate emergency response.

Action: Require all homeowners and businesses to provide a defense able space around there structures as provided in the international fire code.

Time Frame: Continuing action. Twenty year plan
Funding: National Fire Plan and grants
Estimated Cost: $5,000.00
Staff: Brian Head Public Safety
Background: International Fire Code and Fire Wise publications

Action: Provide the necessary emergency services to properly respond to the effects of a wildland fire.

Time Frame: In Place
Funding: Brian Head Town and Iron County
Estimated Cost: $5,000.00
Staff: Brian Head Public Safety(police, fire, EMS) and other emergency services provided in Iron County
Background: We feel that emergency services located in the Iron County region will be adequate to deal with the effects of a wildland fire in Brian Head Town.

Kanarraville

Problem Identification: Kanarraville is surrounded by dry brush and juniper trees that have suffered 5 years of drought. The canyon winds from Kanarra

Canyon increase the fire threat. The town is situated at the mouth of the canyon. The town has more than adequate water storage to fight fires. (350,000 + gal.)

Goal I3 - Priority High

Objective I3.1- To clean brush from under trees and blade a fire zone protection around the town on county property.
Action: Work with landowners to clean a fire protection area around their properties.
Time Frame: 6 months to two years
Funding: From General Fund of the Town of Kanarraville, Inc./local property owners.
Estimated Cost: $3,000.00
Staff: Contracted workers, local landowners, Town maintenance crew.
Background: Landowners are to be contacted and a request made that dry grass be mowed. Out lying landowners will be asked to clear a fire protection zone. All city property will be mowed and underbrush cleaned out. Iron County will be requested to help with clearing the canyon.

<u>Landslide</u>

Cedar City

Problem Identification: In the "Ground Surface Subsidence in Cedar City" report by Bruce N. Kaliser in January 1978 indicates two areas in sections 26, 27, 33, and 34 of Township 36 South, Range 11 West and Sections 19, 20, 29, and 30 of Township 35 South, Range 10 West that were massive landslide deposit areas. The report stated that Developments of this terrain may reinitiate mass movement.

Goal I4 - Priority Medium

Objective I4.1-Minimize the possibility to reinitiate mass movement in the Landslide areas that are shown on the Kaliser, January 1978 Report.
Action: Inform property owners developing in the area of the possibilities for landslides.
Time Frame: As development is proposed
Funding: None
Estimated Cost:
Staff: City Staff and Property Owner
Background: Bruce N. Kaliser, January 1978 Report on Ground Surface subsidence in Cedar City.

Action: Required Geological and Geotechnical reports for any proposed developments in the designated landslide areas with the possibility of independent reviews of the reports.
Time Frame: With development engineering plans for the area
Funding: Developer
Estimated Cost:
Staff: Licensed Geology and Geotechnical Firms
Background: Required by Cedar City Subdivision OrdinanceChapter 32

Action: Require developers to install developments according to recommends for the Geological and Geotechnical reports provided and approved.
Time Frame: As landslide areas develop

Funding: Developer
Estimated Cost:
Staff: Developer and Contractor
Background:

Flood

County-wide

Coal Creek Flooding in Cedar Valley

Problem Identification: Coal Creek at Cedar City is the outlet of a hydrologic basin of approximately 82 square miles. This basin ranges in elevation from 10,000+ to 5,000 ft. in the Cedar Valley. A 100 year storm would produce a flow of 5,000+ cfs through Cedar City and the unincorporated areas of Cedar Valley. The flow is highly variable. This flow is divided at the Woodbury split so about 1/3 goes west and 2/3 goes north.

Goal I5 - Priority High

Objective I5.1-Reduce flood threat through Cedar City and Cedar Valley.
Action: <u>WEST ROUTE:</u>
With the project coming on Airport Road by Cedar City Corporation the small structure will be increased to the appropriate size, adequate to handle approximately 1,500 cfs, so this west route will go to Quichapa.

The new structure on Hwy. 56 at the intersection with Lund Hwy. is being increased to handle approximately 1,500 cfs also.

Iron County must presently realign and construct a new flood channel below this Hwy. 56 structure for approximately 1 mile. From there to Quichapa
the existing channel must be widened in places and always maintained.

Action:<u>NORTH ROUTE:</u>
The north leg of this channel is in relatively good shape as far as structures are concerned until it reaches Midvalley Road. The structure there must be significantly enlarged. The channel on this leg must be improved thru the Flying "L" Ranch Subdivision, it must also be improved from the Brent Hunter Farm all the way past Regional Wastewater Treatment Plant and to Mud Springs.

Time Frame: Within the next 3 years
Funding: County Public Works routine maintenance and Engineer's budget.
Estimated Cost:
Staff: County Public Works
Background: Flatten side slopes, construct new channel as necessary, clean willows, roses, Russian olive, and cottonwood trees, and debris that impedes flow. Rip rap may be advantageous in certain locations. Some rights-of-way must be obtained.

Fiddlers Canyon Flood Waters

Problem Identification: Floods from Fiddlers Canyon still have some potential of covering Cedar Valley lands.

Goal I6 - Priority High

Objective I6.1-Prevent these waters from doing damage to homes and/or farmlands.
Action: Prevent these waters from doing damage to homes and/or farmlands.

> **Time Frame:** Within the next 3 years
> **Funding:** All possibilities are open
> **Estimated Cost:**
> **Staff:** Public Works personnel
> **Background:** Construct a channel from the west side of the freeway to the north route of the Coal Creek flood channel.

Flooding from Summit Canyon

Problem Identification: Excess spring runoff or thundershower waters from Summit Canyon cause flooding in Summit all too frequently. The main historic and natural flood channel is still discernible upon old aerial photos all the way from the northern town limits to the Little Salt Lake. Over the years the channel has become obstructed and is now functionally obsolete.

Goal I7 - Priority High

Objective I7.1-Keep these waters in the natural and historic flood channel.
Action: Keep these waters in the natural and historic flood channel.

> **Time Frame:** Within the next 10 years.
> **Funding:** County Public Works and Engineer's budget
> **Estimated Cost:**
> **Staff:** County Engineer and Public Works personnel
> **Background:** By survey, mark upon the ground the natural channel. Then construct and/or open it up so when necessary it will convey flood waters thru the town and valley to the Little Salt Lake. Rip rap may be necessary at some locations. Some easements may be necessary to obtain from the landowners.

Flooding in Parowan Valley

Problem Identification: Excess spring runoff or thundershower waters from Parowan Canyon cause flooding in Parowan all too frequently. The main historic an natural flood channel is still discernible upon old aerial photos all the way from the western city limits to the Little Salt Lake. Over the years the channel has become obstructed and is now functionally obsolete.

Goal I8 - Priority High

Objective I8.1-Keep these waters in the natural and historic flood channel.
Action: Keep these waters in the natural and historic flood channel.

> **Time Frame:** Within the next 3 years
> **Funding:** County Public Works and Engineer's budget
> **Estimated Cost:**

Staff: County Engineer and Public Works personnel
Background: By survey, mark upon the ground the natural channel. Then construct and/or open it up so when necessary it will convey flood waters thru the Parowan Valley to the Little Salt Lake. Rip rap may be necessary at some locations. Some easements may be necessary to obtain from the landowners.

Paragonah Town **Flooding from Red Creek in and near Paragonah Town**

Problem Identification: Paragonah town has been flooded by waters from Red Creek much too often. It occurs mostly from July, August, and September thundershowers. Occasionally, excess spring runoff may pose significant threats.

Goal I9 - Priority High

Objective I9.1-Prevent these flood waters from coming through residential areas. Iron County is responsible from the mouth of the canyon to the town boundary and again after it leaves the town boundary to west of I-15. Paragonah is responsible within the town boundary.
Action: Prevent these flood waters from going through residential areas.
Time Frame: Within the next 2 years
Funding: Utah Army National Guard 115th Engineer Battalion, 348 East Main Street, Lehi, Utah 84043, will contribute equipment and personnel, but no cash outlay. Iron County and Paragonah town will purchase what materials are necessary.
Estimated Cost:
Staff: Utah Army National Guard, Iron County, and Paragonah townpersonnel
Background: Construct and/or widen and deepen the existing flood way from the mouth of the canyon to west of I-15. UDOTwill assist with crossing on Old Hwy. 91.

Flood waters from Little Creek Cyn.

Goal I10 - Priority Medium

Problem Identification: Occasionally, there are times when these waters may cover the frontage road on the east side of I-15.

Objective I10.1-Keep the frontage road from being covered by flood waters.
Action: Keep the borrow ditches and culverts on the frontage road clean and functional.
Time Frame: This is a on going maintenance item.
Funding: County Public Works
Estimated Cost:
Staff: County Public Works personnel
Background: Keep the borrow ditches and culverts clean.

Holt Canyon Flood Water in Hwy. 18 Right-of-Way

Problem Identification: When there is above normal winter snowfall, the spring runoff waters from Holt Canyon will make it all the way to Hwy. 18 in the Escalante Valley. These waters within the Hwy. right-of-way present a safety hazard.

Goal I11 - Priority Medium

Objective I11.1-Prevent these waters from getting to the Hwy. 18 right-of-way.

Action: Prevent these waters from getting to the Hwy. 18 right-of-way.

Time Frame: Within the next 3 years

Funding: a) Iron County Public Works b) UDOT c) Natural Resource Conservation Service d) Involved land owners

Estimated Cost:

Staff: Personnel for the above listed entities

Background: Construct a diversion structure in the Holt Canyon drainage to take part of this water east and spread it on various farms and in storage ponds. Construct 5 ponds on the Sherwood Bracken land to retain water so it will percolate into the underground water basin. Construct ditches so if the 5th pond overflows then the water will be spread to various farmlands.

Shoal Creek Flooding in Escalante Valley.

Problem Identification: If there is a heavy snow year and both the upper and lower Enterprise Reservoirs are relatively full, the spring runoff waters may reach almost to Beryl. This does not happen very often, but when it does it can be serious.

Goal I12 - Priority High

Objective I12.1: To prevent these waters from reaching Beryl and causing problems.
Action:

Time Frame: This is an ever and on going issue.

Funding: Maintenance dollars and efforts.

Estimated Cost:

Staff: County Engineer and Public Works personnel

Background: Prevent land use activities and growth from obstructing the natural drainage ways.

Cedar City

Problem Identification: Coal Creek is the main drainage through Cedar City from Cedar Mountain. Flooding through the City along Coal Creek would damage homes, businesses and the City's infrastructure if the projected flows of 6,600 CFS were realized.

Goal I13 - Priority High

Objective I13.1-Install flood control improvements along Coal Creek that would contain the design flood and protect the adjacent homes, businesses and City infrastructure.
Action: Relocate the irrigation structure in Coal Creek that is currently located west of the SR-130 bridge structure.

Time Frame: 2004-2005

Funding: City and Federal Natural Resources Conservation Svc.

Estimated Cost:

Staff: City Engineering Staff/NRCS Staff and Contractor

Background: A Grant from the NRCS has been secured for thisproject.

Action: Construct berms, levees, and other channel improvements that will contain the 100-year flood within the channel.

Time Frame: 2005-2006

Funding: City and Federal Natural Resources Conservation Svc.

Estimated Cost:

Staff: City Engineering Staff/NRCS Staff and Contractor
Background: A Grant from the NRCS has been secured for this project.

Action: Obtain a Letter of Map revision from FEMA that will remove the flood zone designation from the property adjacent to Coal Creek.

Time Frame: 2006
Funding: City and Federal Natural Resources Conservation Svc.
Estimated Cost:
Staff: City Engineering and Consultant
Background: A Conditional Letter of map revision has been obtained from FEMA for the project. When the project is completed, the actual Letter of Map Revision can be obtained.

Cedar City

Problem Identification: In 1962 Cedar City and the Soil Conservation Service constructed flood control facilities in the mouth of the Greens Lake drainage to protect the developments downstream from flooding from drainage above.

Goal I14 - Priority High

Objective I14.1-Maintain the effectiveness of the flood control improvements in the Greens Lake Drainage to protect the affected development within the center of Cedar City.
Action: Annually perform inspections of the Greens Lake flood control improvements to identify maintenance action items.

Time Frame: February of Each Year
Funding: None
Estimated Cost:
Staff: City Engineering Staff
Background: Inspection and maintenance to be performed according to recommendations of the facility SOP and EAP.

Action: Annually perform the maintenance identified from the inspection on the Greens Lake Flood Control Improvements.

Time Frame: March thru April of each year
Funding: City Drainage Maintenance Budget
Estimated Cost:
Staff: City Drainage Maintenance Crews
Background: Inspection and maintenance to be performed according to recommendations of the facility SOP and EAP.

Action: Clean grates on the Greens Lake Flood Control Improvements to ensure unobstructed flow.

Time Frame: Monthly during the months of April through October and during all storms.
Funding: City Drainage Maintenance Budget
Estimated Cost:
Staff: City Drainage Maintenance Crews
Background:

Cedar City

Problem Identification: In 2001 Cedar City constructed flood control facilities in the mouth of the Dry Canyon drainage to eliminate the FEMA flood zones and protect the developments in the area from 100 year flooding from drainage above.

Goal I15 - Priority High

Objective I15.1 - Maintain the effectiveness of the flood control improvements in the Dry Canyon Drainage to protect the affected developments.
Action: Annually perform inspections of the Dry Canyon flood control improvements to identify maintenance action items.

> **Time Frame:** February of each year
> **Funding:** None
> **Estimated Cost:**
> **Staff:** City Engineering Staff
> **Background:** Inspection and maintenance to be performed according to recommendations of the facility SOP and EAP.

Action: Annually perform the maintenance identified from the inspection on the Dry Canyon Flood Control Improvements.

> **Time Frame:** March thru April of each year
> **Funding:** City Drainage Maintenance Budget
> **Estimated Cost:**
> **Staff:** City Drainage Maintenance Crews
> **Background:** Inspection and maintenance to be performed according to recommendations of the facility SOP and EAP.

Action: Clean Grates on the Dry Canyon Flood Control Improvements to ensure unobstructed flow.

> **Time Frame:** Monthly during the months of April through October and during all storms.
> **Funding:** City Drainage Maintenance Budget
> **Estimated Cost:**
> **Staff:** City Drainage Maintenance Crews
> **Background:**

Kanarraville

Problem Identification: Kanarraville Town is in the foothills of Kanarra Mountain and at the mouth of the Kanarra Canyon and main drainage from the mountain. The slope of the terrain to the east of Kanarraville increases the probability of flooding.

Goal I16 - Priority High

Objective I16.1-To clean and refurbish existing dikes to the north and south and one dike in the central area of town.
Action: To maintain the existing dikes so they operate at peak performance.

> **Time Frame:** 6 months to 1 year
> **Funding:** Town resources and general maintenance expenses
> **Estimated Cost:** $1,000 - $2,000

Staff: Contracted equipment operators, citizens, town maintenance
Background: Rebuild central dam that was destroyed with the new water tank. Clean out brush from the north dam. Rebuild the top of the south dam levee.

Parowan

Problem Identification: Flooding within Parowan City limits, along the creek.

Goal I17 - Priority High

Objective I17.1-Reduce flood threat from Parowan Canyon within Parowan City.
Action: Maintain and improve flood channel.
Time Frame: 2004-2005
Funding: Parowan City
Estimated Cost:
Staff: Parowan City Public Works/Electrical Departments
Background: To maintain these flood channels on an annual basis and during storms.

Action: Maintenance of channels and bridge openings.
Time Frame: Immediate
Funding: Parowan City (minimal)
Estimated Cost:
Staff: Parowan City Public Works Crew
Background: Keep all bridge openings and upstream channels free of debris to prevent constriction during high flows.

Problem Identification: Existing flood maps are outdated and inaccurate.

Goal I18 - Priority High

Objective I18.1-Identify areas susceptible to flooding
Action: Work with DES on flood plain mapping study to determine areas of potential flood threat.
Time Frame: 3 to 5 years
Funding: unknown
Estimated cost: unknown
Staff: State and contractor
Background: Parts of Parowan City have been listed with FEMA as designated flood hazard areas.

Earthquake

Brian Head

Problem Identification: The U.S. Geological Survey, Geologic Map of Brian Head Town is Township 36-37 Range 09 W. These maps show that we have Geological Faults that transverse our area.

Goal I19 - Priority High

Objective I19.1-Minimize the damage caused by an earthquake of the destructive magnitude and provide the appropriate emergency response.

Action: Require construction of all structures requiring a building permit to be constructed according to the 2000 International Building Code structural design requirements.

Time Frame: As building permits are approved
Funding: Town General Fund
Estimated Cost:
Staff: Town Building Department Staff
Background: 2000 International Building Code and the U. S. Geological Survey, Geological Map of the Brian Head area.

Action: Provide the necessary emergency services to properly respond to earthquake damage.

Time Frame: In place
Funding: Brian Head and Iron County
Estimated Cost:
Staff: Brian Head Public Safety(Police, fire, EMS), and the Iron County Sheriff's Office, Iron County Ambulance and the Iron County Fire Department.
Background: We feel that emergency services will be adequate to respond to damages caused by the effects of an earthquake.

Cedar City

Problem Identification: The U.S. Geological Survey, Geologic Map of the Cedar City Quadrangle, Iron County, Utah show two Geologic Faults running through Cedar City. The Hurricane Fault runs along the toe of the mountain on the east side of the City, The North Hills Fault approximately parallels I-15. Both faults run in an approximate north/south direction. Ground Motion Figures from the International Building Code indicate that the Cedar City area is susceptible to earthquake activity.

Goal I20 - Priority High

Objective I20.1-Minimize the damage caused by an earthquake of the destructive magnitude and provide the appropriate emergency response.
Action: Require construction of all structures requiring a building permit to be constructed according to the 2000 International Building Code structural design requirements.

Time Frame: As building permits are approved
Funding: City General Fund
Estimated Cost:
Staff: City Building Department Staff
Background: 2000 International Building Code and the U. S. Geological Survey, Geologic Map of the Cedar City Quadrangle, Iron County, Utah

Action: Provide the necessary emergency services to properly respond to earthquake damage.

Time Frame: In Place
Funding: Cedar City and Iron County
Estimated Cost:
Staff: Cedar City Fire Department and Police Department, Iron County Sheriff's Department and Ambulance Service
Background: While the timing of extent of earthquake damages cannot be predicted, it is felt the current level of emergency services would be adequate to respond to damages caused by a moderately significant earthquake.

Kane County

Natural Hazards Awareness

Countywide

Problem Identification: The citizens of Kane County need to be made aware of the natural hazards that exist in their area. Through public awareness program earthquake safety, Africanized bee issues, and general individual preparedness programs will be presented.

Goal K1 - Priority Medium

Objective K1.1: To increase the level of awareness for the residents of Kane County.

Action: Conduct a Countywide community awareness campaign
Estimated Cost: $10,000.00
Time Frame: 2 to 5 years
Funding: Public Funds
Staff: Emergency Services Personnel.
Background: Create a base of natural hazard identification, risk assessment, and planning. Incorporated planning objective Countywide.

Big Water

Problem Identification: The citizens of Big Water need to be made aware of the natural hazards that exist in their area. Through public awareness program earthquake safety, Africanized bee issues, and general individual preparedness programs will be presented.

Goal K2 – Priority Medium

Objective K1.2: To increase the level of awareness for the residents of Big Water.

Action: Conduct a Big Water community awareness campaign
Estimated Cost: $5,000.00
Time Frame: 2 to 5 years
Funding: Public Funds
Staff: Emergency Services Personnel.
Background: The Town of Big Water is a somewhat isolated community. There is a greater need for a specific awareness program.

Wildfire

Countywide

Problem Identification: Specific areas of the county are susceptible to Wildland Fire threat. Specific areas of concern include: Glendale, Alton, Duck Creek, Strawberry Valley, Navajo Lake, and Meadow Spring.

Goal K3 - Priority High

Objective K3.1 Protect residential areas from wildfire threat in the unincorporated areas of the county

Action Identify, develop and support Firewise communities

Time Frame: Ongoing
Funding: National Fire Plan Grant
Estimated Cost: $5,000.00 per plan
Staff: County, State Forestry Fire and State Lands, US Forest Service
Background: Firewise program is a community based fire mitigation program.

Action Implement fuel break, lot clean up and other recommendations of completed community fire plans

Time Frame: 5 years
Funding: Firewise grant
Estimated Cost: $80,000.00 per year
Staff: Local, Private, County
Background: Local support of Firewise communities is essential for a successful program.
Problem Identification: Beetle infestation is a concern in the areas of the County. Recent drought has weakened the trees allowing beetles to spread at an alarming rate. This is creating a fire hazard in the timber and in the pinion. This is also occurring in the subdivisions adjacent to areas of beetle kill.

Goal K4 - Priority High

Objective K4.1 Minimize the effects of bark beetle infestation in order to reduce wild fire danger

Action Identify those subdivisions that are impacted by beetle kill

Time Frame: 2 years
Funding: Unknown
Estimated Cost: Unknown
Staff: Contractors, State and Federal Agricultural, USFS, State FFSL
Background: Primary and secondary residential structures continue to encroach in areas of fire.

Action Implement fuel break, lot clean up and other recommendations of completed community fire plans

Time Frame: 5 years
Funding: Unknown, Firewise, other grants
Estimated Cost: $80,000.00 per year
Staff: Private, County
Background: Bark beetle infestation has created a severe fire hazard in these areas

Alton

Problem Identification: The current water system in Alton is constructed with 4” lines. The system is not adequate to protect the structures in town from a wildfire threat. Alton is listed as a community at risk from Wildfire.

Goal K5 - Priority High

Objective K5.1 Improve Alton Town's ability to protect it's citizens and property from wildfire threat

Action: Upgrade the existing water distribution system to provide a capacity to fight Wildland Fires that threaten town

> **Time Frame:** As soon as possible, 1 – 2 years
> **Funding:** Unknown, possible grants
> **Estimated Cost:** Unknown
> **Staff:** Private Contractor, Town
> **Background:** This is critical to the community' ability to fight fires.

Glendale

Problem Identification: Glendale is susceptible to wind driven Wildland Fire

Goal K6 - Priority High

Objective K6.1 Protect the community from a Wildfire threat

Action: Complete a community fire plan

> **Time Frame:** 2-3 years
> **Funding:** National Fire Plan Grant
> **Estimated Cost:** $5,000.00
> **Staff:** County, State
> **Background:** Contact Keith Park to begin the planning process

Kanab

Problem Identification: Weeds and trees in and along Kanab Creek from 500 North to Airport have created a fire hazards

Goal K7 – Priority High

Objective K7.1 Protect area from wildland fire

Action Evaluate the use of controlled burns in this area

> **Time Frame:** Winter Months
> **Funding:** Unknown, possible County or State
> **Estimated Cost:** Dependent upon scope of project
> **Staff:** Fire Department.
> **Background:** Every year or two a fire starts and is very hard to put out due to accessibility.

Action Build walking trails so fire department can us it to access area.

> **Time Frame:** When funds are available.
> **Funding:** Grants
> **Estimated Cost:** $ 1,500,000
> **Staff:** County, volunteers

Background: Access into area hinders firefighting efforts

Flood

Countywide

Problem Identification: Flood occurs primarily from spring snow-melt in the higher elevations and summer flash flooding. Identifying and then controlling flooding will assist in responding to flood events. Protection of life and property before, during, and after a flooding event is essential.

Goal K8 – Priority High

Objective K8.1 Promote flood insurance throughout the County

Action: Create outreach document promoting flood insurance and include in local newspaper(s), libraries, and other public buildings.

Time Frame: 1 year
Funding: Minimal
Estimated Cost: Unknown
Staff: County Engineer, State Floodplain Manager, DES
Background: General public is usual not aware they can purchase flood insurance.

Objective K8.2 Reduce threat of unstable canals throughout the County. Identify County-wide canal systems

Action: Map and assess for structural integrity canal systems in the County

Time Frame: 3-5 years
Funding: Federal grants
Estimated Cost: Unknown
Staff: County Engineer, County Public Works, County Information and Technology, County Emergency Management
Background: Private and Public canals are used for transportation and dispersion of water as well as flood control.

Objective K8.3 Reduce flooding threat in Kanab, Orderville and Glendale

Action: Clear debris and other material from streams prior to spring snow melt.

Time Frame: Ongoing
Funding: None
Estimated Cost: Unknown
Staff: County Public Works
Background: Most flooding is attributed to debris-laden streams.

Objective K8.4 Ensure EOC(s) are equipped to respond to flooding.

Action: Obtain communication equipment that will allow for timely response to flooding.

Time Frame: 1 year
Funding: Federal Grants

Estimated Cost: $30,000
Staff: County Sheriff, County Emergency Management
Background: An alternate EOC(s) also need dequate communication capabilities is essential between all response agencies within the County.

Objective K8.5 Support updating of flood hazard data

Action: Support and encourage participation in the NFIP Flood Map Mod Program.
Time Frame: Ongoing
Funding: Federal
Estimated Cost: Unknown
Staff: County Engineer, State Floodplain Manager
Background: Accurate flood maps assist the County in the administration of the NFIP and better reflects flood risk within the County.

Glendale

Problem Identification: There is a flood control problem on the east side of town.

Goal K9 - Medium

Objective K9.1 Evaluate current t flooding problems within Glendale Town

Action: Contract with engineering firm to evaluate flood hazard
Time Frame: 5 years
Funding: Grants, federal
Estimated Cost: $3,000,000.00
Staff: Contract
Background: More information is needed to assess the hazard and then develop a strategy and obtain fundning

Kanab

Problem Identification: 100 North Street to Toms Canyon. At the present time, one of the areas of greatest concern near existing development is along 100 North Street to Toms Canyon. The estimated 100-year flow (most of which originates in undeveloped areas) is 1.588 cfs. The flow capacity of 200 North Street at one foot above the top of curb is approximately 800 cls which leaves 788 efs which should be carried in a storm drain to reduce the danger and risk of damage during periods of high runoff.

Goal K10 - High

Objective K10.1 Reduce flood threat in Kanab.

Action: Install adequate storm drain for excess flows.
Time Frame: When funding is available.
Funding: Grants.
Estimated Cost $1,018,500.
Staff: Contract
Background: **:** An 84 diameter storm drain approximately 4,850 feet in length is needed to carry the 788 cfs discussed.

Problem Identification: Savage Point Drainage Basin. The Savage Point Drainage basin is comprised of 125 acres, the majority of which is steep, impervious areas.

Goal K11 - High

Objective K11.1 Reduce flood threat in Kanab below 300 S.

Action: Increase storage capacity of drainage basin
Time Frame: When funding is available.
Funding: Grants.
Estimated Cost: $150,000.00
Staff: Contract
Background: This detention basin is not designed to eliminate flooding potential but would alleviate the problem.

Problem Identification: The Heatons have allowed the city to direct storm water onto their field so they can irrigate with it. When there is more water than can be absorbed we need a pipe to take the excess to the creek.

Goal K12 - Low

Objective K12.1 Stop erosion to Heaton property.

Action: Install pipe to divert excess storm water
Time Frame: In the next two years.
Funding: Grants or general funds.
Estimated Cost: $60,000.00
Staff: Contract
Background: Make sure required permitting is in place prior to diverting storm water into the stream.

Problem Identification: Pugh Canyon This area has a runoff of (1,670 efs) and will need detention pond and storm drain facilities.

Goal K13 - High

Objective K13.1 Reduce flood threat to Highway 89 and land below.

Action: Install detention pond and storm drains
Time Frame: When funding is available.
Funding: Grants
Estimated Cost: $4,746,000
Staff: Contract
Background: This will protect structures and infrastructure from flooding.

Problem Identification: Kanab Creek Ranchos (Heaton Dr.) The run off from this area runs through most of the home and the City Park in the Ranchos.

Goal K14 - High

Objective K14.1 Reduce flood threat in Kanab Creek Ranchos

Action: Develop adequate storm water system in area

Time Frame: When funding is available.
Funding: Grants
Estimated Cost: $100,000.00 to $160,000.00
Staff: Contract
Background: Area is susceptible to storm water flooding following a severe thunderstorm

Orderville

Problem Identification: Runoff due to severe storms is a flooding problems which occurs somewhat regularly throughout the town.

Goal K15 - Medium

Objective K15.1 Minimize the effects of storm runoff

Action: Construct infrastructure improvements to contain storm runoff

Time Frame: Unknown
Funding: Unknown
Estimated Cost: $3,000,000.00
Staff: Contractors, City and County
Background: Construct curb & gutter, sidewalks with driveway access and line with concrete, and clean and maintain drainage washes, install debris grates on culverts

<u>Severe Weather</u>

Countywide

Problem: Winter storms, summer thunderstorms, hail, and high winds over southern Utah have a dramatic effect on regional commerce, transportation, and daily activity and are a major forecast challenge for local meteorologists.

Goal K16 – Priority High

Objective K16.1 Protect County from adverse affects of severe weather

Action: County participation in the StormReady program.

Time Frame: 2 Year
Funding: State and Federal
Estimated Cost: Unknown
Staff: City and County Emergency Management
Background: Set up within the county emergency management and encourage all cities to participate, all requirements of the National Weather Service StormReady program.

Action: Encourage avalanche preparedness for county backcountry users in the northeastern portion of the County

Time Frame: 1 Year
Funding: Minimal

Estimated Cost: Minimal
Staff: County Emergency Management State Hazard Mitigation Team members, Utah Avalanche Forecast Center.
Background: Avalanches and avalanche preparedness is not often considered when discussing mitigation on the county or city level, yet several people die each year in Utah's backcountry. While the avalanche terrain is mainly on US Forest Service land the search and rescue for the lost individual in more often than not coordinated by emergency managers with search parties comprised of county and city staff. Introductory avalanche awareness training could lessen the costs to Kane County and the cities within the county. Most avalanche victims die in avalanches started by themselves or someone in there party. Thus, education can limit the number of avalanche related searches each year.

Action: Assess EOCs to ensure they are grounded lightning, to include buildings with towers, etc.
Time Frame: 2-3 years
Funding: Federal Grants
Estimated Cost: Unknown
Staff: County Emergency Management
Background: EOCs and alternate EOCs **,** Sheriff's Dispatch, Command Vehicle(s)and associated equipment need to be protected from severe weather events including lightning.

Landslide

Countywide

Problem Identification: There is a potential risk to structures located in areas identified by the FCAOG GIS as landslide risk areas.

Goal K17 – Priority High

Objective K17.1 Reduce potential landslide risk on commercial and residential structures in areas of known landslide potential.

Action: Assess the probability of landslides and identify specific structures at risk
Time Frame: Undetermined
Funding: Property owner
Estimated Cost: Unknown
Staff: Unknown
Background: Soil surveys and other engineering surveys are needed.

Problem Identification: Rockfall may impact structures within the County

Goal K18 – Priority Medium

Objective K18.1 Remove risk to homes by removing rocks.

Action: Remove large rocks overhanging existing developments.
Time Frame: Undetermined
Funding: Not applicable
Estimated Cost: Not applicable

Staff: City, County Planning
Background: There are several areas in Kanab and Johnson Canyon where rocks overhang existing structures. Developments should include removal or remediation of large rock areas from being dislodged by earthquake or rains.

Action: Remove potential rock hazards prior to building homes.
Time Frame: 5 year
Funding: None
Estimated Cost: Unknown
Staff: Planning Departments
Background: Prior to building, require builder/owner to secure or remove possible rock hazard.

Earthquake

Countywide

Problem Identification: Transportation and utilities services could be severely impacted.

Goal K19 – Priority High

Objective K19.1 Provide for emergency response and relief

Action: Identify and maintain critical transportation and utility services
Time Frame: ongoing
Funding: Local governments and possible grants
Estimated Cost: Unknown- Determined by the extent of damage anticipated.
Staff: County and City staff.
Background: Critical transportation systems need to be maintained.

Problem Identification: Many communities within the County are surrounded by rocky slopes. Kanab Creek and the East Fork of the Virgin River run through areas with structures. There is a high probability of rockfall caused by seismic events and possible liquefaction along the river areas.

Goal K20 – Priority High

Objective K20.1 Raise awareness of problems that could occur as a result of an earthquake.

Action: Maintain adherence to Land Use codes and restrictions to building in sensitive areas.
Time Frame: Immediate and ongoing
Funding: Not applicable
Estimated Cost: Not applicable
Staff: Town staff.
Background: Some of the problems identified include falling rocks, diversion of the Kanab Creek and the Virgin River due to landslides.

Problem Identification: Damage to structures and utilities is likely during a seismic event.

Goal K21 – Priority High

Objective K21.1 Reduce threat to public safety during an earthquake

Action: Retrofit inadequate construction.

Time Frame: 10 years+
Funding: Private
Estimated Cost: Extreme
Staff: County Inspection Department, County Engineering Department, Private Engineers.
Background: Old and inadequate construction, buildings with unreinforced masonry to be mitigated.

Problem Identification: Lack of public awareness about earthquake damage prevention practices.

Goal K22 – Priority High

Objective K22.1 Educate community on earthquake damage prevention practices

Action: Produce and/or distribute handouts and provide inspections to identify shortcomings in earthquake preparedness.

Time Frame: 1 year+
Funding: none identified
Estimated Cost: $50,000
Staff: Fire Department, Inspection Department
Background: Having a community with residents educated on earthquake damage prevention practices will ensure greater safety of all residents of the County.

Objective K22.2 Educate community on earthquake damage prevention practices

Action: Educate the public on damage prevention practices for earthquakes

Time Frame: 2 years
Funding: Grants from state and Federal governments
Estimated Cost: $50,000-$75,000
Staff: Emergency Management and volunteers
Background: Continue to establish a C.E.R.T. program in the County Earthquakes are taught as being the biggest hazard facing those in the area. Teaching the C.E.R.T. class should get the message out to residents.

Drought

Countywide

Problem Identification: Cyclical periods of drought place a strain on community culinary water resources.

Goal K23 – Priority High

Objective K23.1 Conserve culinary water by educating the public

Action: Educate the public on the need to be water wise
Time Frame: Ongoing
Funding: City funds
Estimated Cost: minimal
Staff: Water purveyor and newsletter editor
Background: Use a newsletter to educate the public

Objective K23.2 Conserve culinary water by conservation

Action: Maintain and enforce rate policies that encourage water conservation
Time Frame: Ongoing
Funding: County funds
Estimated Cost: minimal
Staff: Water purveyor and newsletter editor
Background: County should evaluate a tiered water system.

Problem Identification: Cyclical periods of drought place a strain on availability of community culinary water and irrigation water resources.

Goal K24 – Priority High

Objective K24.1 Meet current and future water needs of community

Action: Develop additional source and storage as well as implement conservation plans implemented.
Time Frame: Ongoing
Funding: City funds, State and Federal Government loans and/or grants
Estimated Cost: To be determined
Staff: County Staff, Professional Services, Contractors
Background: To meet the needs of a community's residential and businesses water users, vigilance in locating new and additional sources as well as increasing storage capacity to meet current needs as well as future need is a must.

<u>Insect Infestation</u>

Countywide

Problem Identification: Mormon crickets, cutworms and mosquito are a problem

Goal K25 – Priority Low

Objective K25.1 Reduce the impact and severity of insects

Action: Spread insect bait and spray for mosquitoes
Time Frame: When required
Funding: City and County funds, Mosquito abatement funds come from property tax
Estimated Cost: Approximately $3.00 per property owner per month
Staff: Abatement District
Background: Abatement Districts are critical in the controlling of insects

Action: Conduct aerial spraying to reduce infestations

Time Frame: As infestations occur

Funding: By private individuals in most cases

Estimated Cost: Varies, depending on acreage treated

Staff: Contractor

Background: Agricultural fields are been subject to insect infestation especially during the recent years of drought.

Paiute Indian Tribe of Utah

Wildfire

Cedar Band

Problem Identification: Man-made or lightening caused fires have occurred at times on the Hurricane Hills about 8 miles South of Cedar City on the East side of I-15

Goal P1- Priority High

Objective P1.1 Reduce the threat of Wildfire
Action: Draft a Community Fire Plan
Time Frame: next fiscal year
Funding: Tribal and Federal funds
Estimated Cost: minimal
Staff: Regional Fire Planner
Background: Contact Keith Parke

Indian Peaks Band

Problem Identification: Man-made or lightening caused fires have occurred at times on the Hurricane Hills about 8 miles South of Cedar City on the East side of I-15

Goal P2- Priority High

Objective P2.1 Reduce the threat of Wildfire
Action: Draft a Community Fire Plan
Time Frame: next fiscal year
Funding: Tribal and Federal funds
Estimated Cost: minimal
Staff: Regional Fire Planner
Background: Contact Keith Parke to draft the Plan, include firebreaks in Plan

Shivwits Band

Problem Identification: A wildfire threatened the residential area of the Shivwits Band during the summer of 2003 which included evacuation of the community

Goal P3- High Priority

Objective P3.1 Reduce the negative impacts of wildfire on the residents of the Shivwits Band
Action: Complete a Community Fire Plan of the Shivwits residential area
Time Frame: 6mo.-1 year
Funding:
Estimated Cost: minimal or no cost
Staff: BLM/State/Tribe

Background: Contact Keith Parke to draft the Plan

Flood

Cedar Band

Problem Identification: The Cedar Band land including homes is located in a watershed area which floods regularly on normal years

Goal P4- Priority High

Objective P4.1 Minimize flooding on the West side of the Hurricane Hills located on Tribal land
Action: Create a diversion channel and retention basin along dry creek
Time Frame: next fiscal year
Funding: Tribal & federal
Estimated Cost: unknown
Staff: Tribal & county staff
Background: construct a diversion channel and retention basin

Indian Peaks Band

Problem Identification: The roadway leading to the water tank washes out regularly

Goal P5- Priority High

Objective P5.1 Prevent future roadway erosion
Action: Add culverts to keep water off of the road
Time Frame: 3 years
Funding: state & federal
Estimated Cost: unknown
Staff: state & federal
Background: dig and add culverts to divert water, pave the road to the water tank

Problem Identification: Increase threat of flooding due to drought conditions

Goal P6- Priority Medium

Objective P6.1 minimize flooding
Action: Conduct a study to determine the location of flood water flows
Time Frame: 3 years
Funding: state & federal
Estimated Cost: unknown
Staff: state & federal
Background: contact state and federal agencies, contract for the study

Shivwits

Problem Identification: Wildcat Wash has the potential to impact Shivwits residents with flood waters.

Goal P7- Priority High

Objective P7.1 Reduce the threat of flooding along Wildcat Wash
Action: To store and carry flood waters safely through the residential area
Time Frame: 6 mo. To 3 years
Funding: UDOT, Washington County
Estimated Cost: undetermined
Staff: Washington County/UDOT
Background: Enlarge culverts carrying Wildcat Wash flows under Old Highway 91, repair and/or replace the detention basin on the Wash

Problem Identification: After a significant rainstorm the area near the turn off to Anasazi Valley along Highway 91 becomes inundated and blocks access to the Shivwits Band community

Goal P8- Priority Medium

Objective P8.1 To reduce the threat of flood water inundation along Highway 91 at the Anasazi Valley turn off
Action: Provide a way for flood waters to travel from one side of the highway to the other without threatening the roadway
Time Frame: 2-5 years
Funding: UDOT, Washington County
Estimated Cost: undetermined
Staff: UDOT, Washington County
Background: Install a culvert under the roadway

<u>Earthquake</u>

Cedar Band

Problem Identification: The Cedar band is located along the Hurricane Fault and is therefore subject to earthquake at any time

Goal P9- Priority High

Objective P9.1 Reduce threat from earthquakes
Action: Continue to follow building codes in construction techniques
Time Frame: ongoing
Funding: Tribal source
Estimated Cost: minimal
Staff: Tribal, counties, state
Background: Continue to use Tribal Housing office to conduct building inspections

Indian Peaks Band

Problem Identification: The Hurricane fault branches off onto Reservation Land. The lower southeast corner of the Reservation, where homes are proposed, may be subject to liquefaction

Goal P10- Priority High

Objective P10.1 Protect structures and utilities from earthquake damage
Action: Have a study done to determine liquefaction danger and severity of the fault

Time Frame: undetermined
Funding: federal grant
Estimated Cost: unknown
Staff:
Background: Contact FEMA to initiate a discussion about the study

Problem Soils

Shivwits Band

Problem Identification: Blue clay has been a problem in the residential area of the Shivwits Band

Goal P11- High Priority

Objective P11.1 To reduce structural damage to residences
Action: Require or request basic soil suitability testing for any new development

Time Frame: on-going
Funding: Tribe
Estimated Cost: minimal
Staff: Tribe
Background: inform home-owner of the potential problem, suggest a contact with a soils engineer to perform testing

Radon Gas

Cedar Band

Problem Identification: The Cedar Band is sitting on a moderate to low Radon area

Goal P12- Priority High

Objective P12.1 Minimize radon gas levels in existing and future homes
Action: Conduct field test of radon levels in homes

Time Frame: next fiscal year
Funding: Tribal
Estimated Cost: minimal
Staff: Tribal
Background: obtain testing hardware to test each home on band land.

Indian Peaks Band

Problem Identification: The Indian Peaks Band is sitting on a moderate to low Radon area

Goal P13- Priority Medium

Objective P13.1 Minimize radon gas levels in existing and future homes
Action: Conduct field test of radon levels in homes

Time Frame: next fiscal year

Funding: Tribal
Estimated Cost-minimal
Staff: Tribal
Background: obtain testing hardware to test each home on band land.

Washington County

<u>Wildfire</u>

County-wide

Problem Identification: Continuing non-compliance with existing building codes and fire codes.

Goal W1 – Priority High

Objective W1.1 Increase compliance with existing building and fire codes.
Action: Develop and enforce current local, state and national codes
Time Frame: Ongoing
Funding: Local, state and federal grants
Estimated Cost: Unknown
Staff: Local, state and federal agencies
Background: Implement and enforce rules, regulations and codes

Enterprise

Problem Identification: Approximately 10 homes are at risk from wildfire

Goal W2 – Priority High

Objective W2.1 Educate homeowners on how to reduce risk of wildfire damage
Action: Conduct an education program on reducing wildfire risks
Time Frame: ongoing
Funding: City
Estimated Cost: minimal
Staff: Fire Chief
Background: Educate homeowners using newsletters and personal contacts of the importance of clearing combustibles from perimeters of their homes

Hurricane

Problem Identification: Fire is a threat to power facilities and transmission lines

Goal W3 – Priority High

Objective W3.1 Reduce threat of utilities interruption due to a wildland fire
Action: Safeguard facilities and poles
Time Frame: Ongoing

Funding: Local
Estimated Cost: Undetermined
Staff: Public Works Crews, Hurricane City Fire Department, 138 Task Force
Background: Power and telephone transmission lines in Hurricane City travel via overhead lines through many developed and undeveloped areas. A wildland fire could disrupt services to customers by igniting poles or arcing. Facilities and transmission lines need to be evaluated and plans implemented to safeguard facilities and poles. Plans must be developed to isolate affected areas and maintain services by rerouting services to customers.

Ivins

Problem Identification: Wildfire is a threat to the west side of the City (west end of Kayenta)

Goal W4 – Priority High

Objective W4.1 Reduce threat of damage due to a wildland fire
Action: Develop a fire break road between Ivins and the Shivwits Indian Reservation
Time Frame: 1 year
Funding: Private, City, State, Federal
Estimated Cost: $10,000 with survey
Staff: Private land owners, Ivins, Reservoir water users, Ivins Public Safety
Background: Past wildfires have been a threat from the west end of the county. A fire access road needs to be provided between Ivins City and the Shivwits Indian Reservation. This will assist in protecting the community by providing a fire break.

New Harmony

Problem Identification: Wildfire is a threat to several large tracts of property in the community

Goal W5 – Priority High

Objective W5.1 Reduce threat of damage due to a wildland fire
Action: Educate the residents of the community on how to make their properties fire safe.
Time Frame: Periodic
Funding: U.S. Forest Service
Estimated Cost: Minimal to town
Staff: Town Staff, U.S. Forest Service
Background: Wildfire is a periodic problem in the New Harmony area, with the Sequoia Fire in 2002 burning 8,200 acres nearby. A few large tracts in town containing residences could have problems from similar fires in the future. The residents of the Town need to be alerted to the dangers of wildfire and be given measures which they can utilize to minimize damage.

Rockville

Problem Identification: Wildfire is a threat due to grasslands drying out during extended dry periods.

Goal W6 – Priority High

Objective W6.1 Reduce threat of damage due to a wildland fire
Action: Educate residents of the value of maintaining firebreaks around their homes

> **Time Frame:** Immediate
> **Funding:** Local, BLM
> **Estimated Cost:** Minimal
> **Staff:** Town, BLM
> **Background:** Rockville lies at the west end of Zion Canyon and is an area of large trees surrounded by open fields of grass bordered by rocky slopes. During extended dry periods the grasslands dry out and represent a potential fire hazard.

St. George

Problem Identification: Interface zones along the Virgin River and other river drainages are causing an exposure to wildfire threat.

Goal W7 – Priority High

Objective W7.1 Reduce threat of damage due to a wildland fire
Action: Thin or remove vegetation causing exposure problem.

> **Time Frame:** 1 year
> **Funding:** Moderate, no local funds
> **Estimated Cost:** Moderate
> **Staff:** No local, possible assistance with BLM/U.S. Forest Service
> **Background:** Vegetative areas along the Virgin River have been subjected to several fires over a number of years. The most recent one damaged several properties and structures. This interface area needs to be thinned and separated from exposure to structures.

Virgin

Problem Identification: The Zion River RV park and power facilities and telephone poles are at greatest risk from wildfire.

Goal W8 – Priority High

Objective W8.1 Reduce threat of damage due to a wildland fire
Action: Thin vegetation along river or create a fire break to protect nearby facilities.

> **Time Frame:** Ongoing
> **Funding:** Moderate, BLM, local funds
> **Estimated Cost:** Moderate
> **Staff:** No local, possible assistance with BLM
> **Background:** The dense river bottom cover provides an ideal location for a wildfire. This interface area needs to be thinned and separated with a firebreak to reduce or eliminate exposure to structures. Redundant communications systems should be installed to provide necessary coverage.

Washington City

Problem Identification: Thick vegetation, mostly tamarisks, along Virgin River near homes.

Goal W9 – Priority High

Objective W9.1 Thin out Virgin River vegetation (tamarisks) and create fire breaks
Action: Cut and chip tamarisks for fire breaks.

- **Time Frame:** 2 years
- **Funding:** Grants
- **Estimated Cost:** $30,000 - $40,000
- **Staff:** Washington City Fire Dept. and BLM fuels crew
- **Background:** Cut 50 ft. to 60 ft. fire breaks from banks to river. Thin out vegetation near homes by river. Major issues surrounding this objective are that the U.S. Army Corps of Engineers wants to preserve vegetation for bank stabilization and it would reduce wildlife habitat. The general public will support fire safety, but those concerned with the existing environment will likely not favor the reduction of wildlife habitat. The tamarisks, however, are an introduced, water-guzzling, weed-type tree. While this project is good for fire safety of the homes nearby, the U.S. Army Corps of Engineers will likely want to preserve vegetation for bank stabilization.

<u>Landslide</u>

County-wide

Problem Identification: There is a potential risk to structures located in areas identified by the FCAOG GIS as landslide risk areas.

Goal W10 – Priority High

Objective W10.1 Reduce potential landslide risk on commercial and residential structures in areas of known landslide potential.
Action: Assess the probability of landslides and identify specific structures at risk

- **Time Frame:** Undetermined
- **Funding:** Property owner
- **Estimated Cost:** Unknown
- **Staff:** Unknown
- **Background:** Soil surveys and other engineering surveys are needed.

La Verkin

Problem Identification: There is potential risk of landslide affecting Toquerville Spring which would severely impact water delivery.

Goal W11 – Priority High

Objective W11.1 Provide for a second means of supplying culinary water to the residents of La Verkin.
Action: Establish and maintain a means to readily connect the City's culinary water users to alternative water sources.

> **Time Frame:** Undetermined
> **Funding:** Local Governments and possible grants/loans
> **Estimated Cost:** To be determined
> **Staff:** LaVerkin City, Toquerville City, Hurricane City
> **Background:** In case Toquerville Springs is damaged, the communities of LaVerkin and Toquerville would need to connect to Cottam Well and Hurricane City water sources. Use of water would need to be curtailed to essential services only.

Rockville

Problem Identification: Several homes within Rockville are located close to rocky slopes and are subjected to potential landslides and rockfalls.

Goal W12 – Priority High

Objective W12.1 Minimizing construction in areas of rockfall and landslides.
Action: Continue to modify land use code to reduce threat to residences.

> **Time Frame:** Undetermined
> **Funding:** Not applicable
> **Estimated Cost:** Not applicable
> **Staff:** Rockville Town Planning Commission, Rockville Town Council
> **Background:** In October 2001, a 16 foot wide boulder that came loose from a nearby hillside rolled into a home in Rockville. The huge rock destroyed the homeowner's bedroom and bathroom and came with 2ft of his head as he slept. According to Dixie State College geologist Professor Kelly Bringhurst, the rock beneath the sandstone is a shale and is very weak and boulders break off and just occasionally tumble down.

St. George

Problem Identification: Rockfall areas are next to residential areas.

Goal W13 – Priority High

Objective W13.1 Remove risk to homes by removing rocks.
Action: Remove large rocks overhanging existing developments.

> **Time Frame:** Undetermined
> **Funding:** Not applicable
> **Estimated Cost:** Not applicable
> **Staff:** City Community Development Staff,Planning Commission, City Council
> **Background:** There are several areas in St. George where rocks overhang existing developments, i.e. in the Bloomington development. Developments should include removal or remediation of large rock areas from being dislodged by earthquake or rains.

Problem Identification: Rockfall areas are next to residential areas.

Goal W14 – Priority Medium

Objective W14.1 Remove rockfall risk to areas being considered for new development.
Action: Remove potential rock hazards prior to building homes.

Time Frame: 5 year
Funding: None
Estimated Cost: Unknown
Staff: City Planning Department
Background: Prior to building, require builder/owner to secure or remove possible rock hazard.

Toquerville

Problem Identification: There is potential risk of landslide affecting Toquerville Spring which would severely impact water delivery.

Goal W15 – Priority High

Objective W15.1 Provide for a second means of supplying culinary water to the residents of Toquerville.
Action: Establish and maintain a means to readily connect the City's culinary water users to alternative water sources.

Time Frame: Undetermined
Funding: Local Governments and possible grants/loans
Estimated Cost: To be determined
Staff: Toquerville City, LaVerkin City, Hurricane City
Background: In case Toquerville Springs is damaged, the communities of Toquerville and LaVerkin would need to connect to Cottam Well and Hurricane City water sources. Use of water would need to be curtailed to essential services only.

Virgin

Problem Identification: There is potential risk of landslide on the hillside along S.R. 9 near the Jesse Lee residence and the 101 Rancho area of Virgin, as well as the well at Anderson Junction along with the water lines running from there to the town.

Goal W16 – Priority High

Objective W16.1 Provide for a secondary means of providing water and essential services
Action: Develop plan for providing essential services should access be disrupted and water disrupted.

Time Frame: Ongoing
Funding: Local Governments and possible grants
Estimated Cost: To be determined
Staff: Town of Virgin, Utah Department of Transportation
Background: In case damage to the Anderson Junction well/spring, the communities of Virgin, LaVerkin and Toquerville would be curtailed to use of water for essential services only. The potential for damage to the 101 Rancho area would necessitate a plan to reroute traffic and repair the damage to S.R. 9. Damage repair would be coordinated as needed.

Flood

County-wide

Problem Identification: Control flooding in unincorporated residential areas of Washington County, (Approximately 12 areas). Flooding occurs from heavy rains and fast moving thunderstorms.

Goal W17 – Priority High

Objective W17.1: Obtain Aerial photography with contours of each residential area in Washington County.
Action: Set horizontal and vertical survey control and order aerial photography with contours for each residential area in the county.

- **Time Frame:** 3 months to 2 years (depending on number of areas).
- **Funding:** Local, State and Federal grants.
- **Estimated Cost:** $7000.00 per residential area, depending on size
- **Staff:** County Staff and contracted staff.
- **Background:** Aerial Topography is needed for master storm drainage design.

Objective W17.2: Design master storm drainage plans for residential areas.
Action: Design master storm drainage plans to handle storm water runoff through residential areas.

- **Time Frame:** 3 months to 2 years, (depending on number of areas worked on)
- **Funding:** Grants
- **Estimated Cost:** $10,000.00 per residential area, depending on size
- **Staff:** County Staff and contracted staff.
- **Background:** Engineers design master storm drainage plans for the residential areas.

Objective W17.3: Implement storm drainage plans throughout the residential areas of Washington County.
Action: Implement storm drainage plans throughout the residential areas of Washington County.

- **Time Frame:** 2 years or as soon as the storm drainage plans are finished.
- **Funding:** State and Federal grants
- **Estimated Cost:** unknown, will depend on the final plans and what is required for facilities
- **Staff:** County and contracted staff
- **Background:** Construct storm drainage facilities and require all new developments to meet county storm drainage plans.

Problem Identification: Control flooding in the Diamond Valley subdivision of Washington County. Flooding occurs from heavy rains and fast moving thunderstorms. Aerial photography completed and the planning phase is almost completed.

Goal W18 – Priority High

Objective W18.1: Implement storm drainage plans throughout the residential areas of Diamond Valley.

Action: Implement storm drainage plans throughout the residential areas of the Diamond Valley subdivision.

Time Frame: 2 years
Funding: State and Federal grants
Estimated Cost: unknown, will depend on the final plans and what is required for facilities
Staff: County and contracted staff
Background: Construct storm drainage facilities and require all new developments to meet county storm drainage plans.

Problem Identification: Control flooding in the Winchester Hills subdivision of Washington County. Flooding occurs from heavy rains and fast moving thunderstorms. Aerial photography completed and the planning phase is almost completed.

Goal W19 – Priority High

Objective W19.1: Implement storm drainage plans throughout the residential areas of Winchester Hills.

Action: Implement storm drainage plans throughout the residential areas of Winchester Hills.

Time Frame: 2 years
Funding: State and Federal grants
Estimated Cost: unknown, will depend on the final plans and what is required for facilities
Staff: County and contracted staff
Background: Construct storm drainage facilities and require all new developments to meet county storm drainage plans.

Problem Identification: Control flooding in the Apple Valley subdivision of Washington County. Flooding occurs from heavy rains and fast moving thunderstorms.

Goal W20 – Priority High

Objective W20.1: Obtain Aerial photography with contours of each residential area in Apple Valley.

Action: Set horizontal and vertical survey control and order aerial photography with contours for each residential area in the county.

Time Frame: 3 months to 2 years (depending on funding).
Funding: Local, State and Federal grants
Estimated Cost: $7,000.00 per residential area, depending on size
Staff: County Staff and contracted staff.
Background: Aerial Topography is needed for master storm drainage design.

Objective W20.2: Design master storm drainage plans for residential areas.

Action: Design master storm drainage plans to handle storm water runoff through residential areas.

Time Frame: 3 months to 2 years, (depending on number of areas worked on)
Funding: Grants
Estimated Cost: $10,000.00 per residential area, depending on size
Staff: County Staff and contracted staff.
Background: Engineers design master storm drainage plans for the residential areas.

Objective W20.3: Implement storm drainage plans throughout the residential areas of Washington County.

Action: Implement storm drainage plans throughout the residential areas of Washington County.

Time Frame: 2 years or as soon as the storm drainage plans are finished.
Funding: State and Federal grants
Estimated Cost: unknown, will depend on the final plans and what is required for facilities
Staff: County and contracted staff
Background: Construct storm drainage facilities and require all new developments to meet county storm drainage plans.

Problem Identification: Control flooding in the Dammeron Valley subdivision of Washington County. Flooding occurs from heavy rains and fast moving thunderstorms.

Goal W21 – Priority High

Objective W21.1: Obtain Aerial photography with contours of each residential area in Dammeron Valley.

Action: Set horizontal and vertical survey control and order aerial photography with contours for each residential area in the county.

Time Frame: 3 months to 2 years (depending on funding).
Funding: Local, State and Federal grants
Estimated Cost: $7,000.00 per residential area, depending on size
Staff: County Staff and contracted staff.
Background: Aerial Topography is needed for master storm drainage design.

Objective W21.2: Design master storm drainage plans for residential areas.

Action: Design master storm drainage plans to handle storm water runoff through residential areas.

Time Frame: 3 months to 2 years, (depending on completion of photography)
Funding: Grants
Estimated Cost: $10,000.00 per residential area, depending on size
Staff: County Staff and contracted staff.
Background: Engineers design master storm drainage plans for the residential areas.

Objective W21.3: Implement storm drainage plans throughout the residential areas of Washington County.

Action: Implement storm drainage plans throughout the residential areas of Washington County.

Time Frame: 2 years or as soon as the storm drainage plans are finished.
Funding: State and Federal grants
Estimated Cost: unknown, will depend on the final plans and what is required for facilities
Staff: County and contracted staff
Background: Construct storm drainage facilities and require all new developments to meet county storm drainage plans.

Problem Identification: Control flooding in Sky Ranch Subdivision of Washington County. Flooding occurs from heavy rains and fast moving thunderstorms.

Goal W22 – Priority High

Objective W22.1: Obtain Aerial photography with contours of each residential area in Sky Ranch.

Action: Set horizontal and vertical survey control and order aerial photography with contours for each residential area in the county.

Time Frame: 3 months to 2 years (depending on number if areas).
Funding: Local, State and Federal grants
Estimated Cost: $7000.00 per residential area, depending on size
Staff: County Staff and contracted staff.
Background: Aerial Topography is needed for master storm drainage design.

Objective W22.2: Design master storm drainage plans for residential areas.

Action: Design master storm drainage plans to handle storm water runoff through residential areas.

Time Frame: 3 months to 2 years, (depending on number of areas worked on)
Funding: Grants
Estimated Cost: $10,000.00 per residential area, depending on size
Staff: County Staff and contracted staff.
Background: Engineers design master storm drainage plans for the residential areas.

Objective W22.3: Implement storm drainage plans throughout the residential areas of Washington County.

Action: Implement storm drainage plans throughout the residential areas of Washington County.

Time Frame: 2 years or as soon as the storm drainage plans are finished.
Funding: State and Federal grants

Estimated Cost: unknown, will depend on the finals plans and what is required for facilities
Staff: County and contracted staff
Background: Construct storm drainage facilities and require all new developments to meet county storm drainage plans.

Enterprise

Problem Identification: There is localized flooding near 100 East Main Street and 300 South Center Street. These threaten 2 commercial buildings and 3 residences.

Goal W23 – Priority High

Objective W23.1 Reduce the threat of flood damage to structures in the City

Action: Catch and channel flood waters from the high school and send them to Spring Creek.

Time Frame: 3-5 years
Funding: Washington County School District, FEMA funds, City Funds
Estimated Cost: $70,000-$90,000
Staff: City and Contractor
Background: This will help alleviate both the 100 East and the 300 South problems.

Problem Identification: There is localized flooding near 100 East Main Street and 300 South Center Street. These threaten 2 commercial buildings and 3 residences.

Goal W24 – Priority Medium

Objective W24.1 Reduce the threat of flood damage to structures in the City

Action: Divert storm water at 200 East and Main Street into existing storm drain catch basin at 200 East 100 North.

Time Frame: 1-5 years
Funding: City Funds and grants
Estimated Cost: $12,000-$15,000
Staff: City and Contractor
Background: This will help alleviate only the 100 East Main Street problem.

Hurricane

Problem Identification: Ashcreek Springs has been contaminated by flooding from time to time.

Goal W25 – Priority High

Objective W25.1 Insure that the water from Ashcreek Springs and the Ashcreek Drainage remain a quality source of culinary water.

Action: Protect the spring source and install and maintain anti-backflow valves.

Time Frame: On-going

Funding: Local governments and possible grants
Estimated Cost: Undetermined
Staff: Hurricane City Public Works, LaVerkin City Public Works, Contractor
Background: Hurricane City has experienced contamination of the culinary water system due to flooding during heavy rain storms in the Ash Creek Drainage. Ongoing maintenance of facilities needs to be done to protect the source.

Ivins

Problem Identification: There is flooding in the "Old Town" area of Ivins.

Goal W26 – Priority High

Objective W26.1 Reduce flooding at the "Old Town" drainage area located between 200 East and 200 West.
Action: Create a Special Improvement Project for storm drainage and roadway improvements.
Time Frame: On-going
Funding: Special Improvement District
Estimated Cost: $2,046,000
Staff: Ivins City
Background: This will eliminate flooding to the homes in the area.

Problem Identification: The roadway and homes on the south side of Center Street between 500 and 600 East in Ivins floods with mud and debris.

Goal W27 – Priority High

Objective W27.1 Reduce flooding in the area 500 East and 600 West along Center Street.

Action: Retain storm water in the street.
Time Frame: On-going
Funding: Special Improvement District
Estimated Cost: $15,000
Staff: Ivins City
Background: Construct settling ponds off of Center Street, increase the size of boxes, divert water along the street through construction of curb and gutter.

LaVerkin

Problem Identification: Area around 200 West and 100 North subject to flooding from storm runoff.

Goal W28 – Priority High

Objective W28.1 Preventing flooding in area near 200 West and 100 North.

Action: Upgrade and expand storm drain system. Keep said systems clear and clean.
Time Frame: On-going
Funding: Local governments
Estimated Cost: To be determined
Staff: LaVerkin City

Background: Upgrading and expanding the storm drain system and ensuring it is kept clear will eliminate flooding to the homes in the area.

New Harmony

Problem Identification: Flooding in the Prince Subdivision is a problem.

Goal W28 – Priority High

Objective 1.1 Reduce flooding threat in portions of New Harmony.

Action: Acquire a sandbagging machine along with empty bags and sand.
Time Frame: immediate
Funding: Local governments
Estimated Cost: $1,500-$2,000
Staff: Residents, Boy Scouts, Other volunteers
Background: Flooding has been a problem in the Prince Subdivision since the subdivision was developed prior to New Harmony adopting a Subdivision Ordinance and Zoning Ordinance. Other developed areas in town are also subject to occasional flooding. Having ability to fill sandbags will provide short-term solution to preventing damage to residences.

Problem Identification: Flooding throughout town caused by clogged channels and bridge openings in town.

Goal W29 – Priority High

Objective 2.1 Reduce flooding threat in New Harmony.

Action: Maintain channel and bridge openings in town.
Time Frame: Ongoing
Funding: Local governments
Estimated Cost: Unknown, Minimal to moderate
Staff: Residents
Background: If the drainages in and around the Town are kept clear on an ongoing basis the likelihood of flooding is diminished.

Problem Identification: Specific flooding threats throughout town have not been quantified and thoroughly studied by a qualified engineering professional.

Goal W30 – Priority High

Objective 3.1 Reduce flooding threat in New Harmony.

Action: Commission an engineering study to determine the feasibility of implementing flood and drainage control measures for the town of New Harmony.
Time Frame: 6 months to 1 year
Funding: Local and grant funds (unknown source)
Estimated Cost: Approximately $15,000 (local $1,000; grant $14,000)
Staff: Town staff and Consulting Engineer
Background: Project will include floodplain mapping and study to determine specific flood threats in town.

Problem Identification: Problems quantified in engineering studies need to be implemented to alleviate flooding problems in town.

Goal W31 – Priority High

Objective 4.1 Reduce flooding threat in New Harmony.

Action: Implement flood control project(s) identified by consulting engineer to reduce flooding in town.

> **Time Frame:** 1-1 ½ years
> **Funding:** Grant from unknown source
> **Estimated Cost:** $70,000-$100,000
> **Staff:** Contractor
> **Background** Specific flood control projects will not be able to be identified until engineering studies determine what needs to be done.

Rockville

Problem Identification: While the Virgin River poses a potential flood threat to the community, the drainage ditches from the tops of the surrounding plateaus represent a real flood hazard.

Goal W32 – Priority High

Objective 1.1 Reduce flooding threat in Rockville.

Action: Keep ditches clean.

> **Time Frame:** immediate and ongoing
> **Funding:** Local governments
> **Estimated Cost:** minimal
> **Staff:** Town personnel, residents
> **Background:** Not much can be done by the community to lessen the threat of the Virgin River, but the town can ensure that the ditches in town are kept free from obstructions.

St. George

Problem Identification: Heavy rains in the City limits along the drainages can cause problems by damaging homes and property by overflowing of the Santa Clara and Virgin Rivers.

Goal W33 – Priority High

Objective 1.1 Reduce flooding threat in St. George.

Action: Clear debris and other material from river beds.

> **Time Frame:** within 2 years
> **Funding:** none
> **Estimated Cost:** use volunteer groups or persons performing mandated civic time.
> **Staff:** City personnel, volunteers

Background: Homeowners and other small groups can be responsible for areas near their homes.

Problem Identification: The Santa Clara River and Virgin River cannot carry capacity due to silt build up.

Goal W34 – Priority High

Objective 2.1 Reduce flooding threat in St. George.

Action: Dredge out river bottoms.
Time Frame: 5 years
Funding: Federal government
Estimated Cost: unknown
Staff: U.S. Army Corps of Engineers
Background: Dredge these two river channels. The Army Corps of Engineers has worked on the Fort Pierce River (Wash) in the past.

Toquerville

Problem Identification: There are drainage problems along Pecan Drive.

Goal W35 – Priority High

Objective 1.1 Improve drainage conditions along Pecan Drive in Toquerville.

Action: Install curb and gutter on Pecan Street.
Time Frame: 3 months
Funding: Class C road funds and general funds
Estimated Cost: $60,000
Staff: City Staff, contractor
Background: Improving Pecan Street will control water flow and protect residences.

Problem Identification: There are drainage problems along Pecan Drive.

Goal W36 – Priority Medium

Objective 2.1 Improve drainage along S.R 17 in Toquerville.

Action: Install additional drain pipe.
Time Frame: 3 months
Funding: Class C road funds and general funds
Estimated Cost: $60,000
Staff: City Staff, contractor
Background: Some work has been done by Toquerville City. Additional issues need to be addressed.

Problem Identification: There are drainage problems in the Chola Creek Subdivision.

Goal W37 – Priority Medium

Objective 3.1 Resolving drainage issues in Chola Creek Subdivision.

Action: Implement the drainage work needed in the subdivision.

Time Frame: immediate

Funding: private developer

Estimated Cost: unknown

Staff: private developer

Background: Toquerville City is currently working with the land owner regarding drainage situation in the subdivision.

Virgin

Problem Identification: The sites identified for greatest risk is the property located at the 101 Rancho area, the Zion River RV Park, the North Creek area, and other property along the Virgin River flow.

Goal W38 – Priority High

Objective 1.1 Reduce flooding threat in portions of the town of Virgin.

Action: Clear debris and other material from waterways.

Time Frame: Ongoing

Funding: Local government and possible grants

Estimated Cost: To be determined.

Staff: Virgin town and any other professional assistance needed.

Background: Keeping the waterways clear of sludge buildup will help protect portions of the town from flooding.

Washington

Problem Identification: Property owners/developers wanting to develop within flood plains of the Virgin River, Mill Creek, and along storm washes.

Goal W39 – Priority High

Objective W39.1 Reduce potential flood risks.

Action: Update FEMA Flood Insurance Rate Maps.

Time Frame: 5 years

Funding: Grants

Estimated Cost: $50,000

Staff: FEMA

Background: FEMA flood maps are inaccurate and out of date. The City is experiencing development pressures along the floodplains. Funding of this activity would be positively pursued if grants are received. Otherwise may be cost prohibitive to update maps all at once.

Action: Require Letter of Map Amendment (LOMA)/Letter of Map Revision (LOMR) for suspected inaccurate floodplains prior to development design.

Time Frame: On-going

Funding: Developers

Estimated Cost: case by case

Staff: Developer's consulting engineers with review by FEMA and Washington City Community Development Department.
Background: Allow developers to submit LOMAs/LOMRs to FEMA for approval for a more accurate delineation of floodplain and their design development. Property owners and developers may feel that this requirement for LOMAs/LOMRs may be too restrictive.

Action: Do not allow development in the Virgin River and Mill Creek floodplains
Time Frame: On-going
Funding: N/A
Estimated Cost: N/A
Staff: Washington City Community Development Department
Background: Do not allow major development in the Virgin River and Mill Creek floodplains, other than open space and recreational uses and possible floodplain stabilization.

Earthquake

La Verkin

Problem Identification: Transportation and utilities services could be severely impacted.

Goal W40 – Priority High

Objective W40.1 Provide for emergency response and relief

Action: Identify and maintain critical transportation and utility services
Time Frame: ongoing
Funding: Local governments and possible grants
Estimated Cost: Unknown- Determined by the extent of damage anticipated.
Staff: City staff.
Background: Critical transportation systems need to be maintained.

Rockville

Problem Identification: Rockville is surrounded by rocky slopes and the Virgin River runs through the town. There is a high probability of rockfall caused by seismic events and possible liquefaction along the river areas.

Goal W41 – Priority High

Objective W41.1 Raise awareness of problems that could occur as a result of an earthquake.

Action: Maintain adherence to Land Use codes and restrictions to building in sensitive areas.
Time Frame: immediate and ongoing
Funding: Not applicable
Estimated Cost: Not applicable
Staff: Town staff.

Background: Some of the problems identified include falling rocks, diversion of the Virgin River due to landslides.

Problem Identification: Lack of public awareness about earthquake damage prevention practices.

St. George

Problem Identification: Damage to structures and utilities is likely during a seismic event.

Goal W42 – Priority High

Objective W42.1 Reduce threat to public safety during an earthquake.

Action: Retrofit inadequate construction.

Time Frame: 10 years+
Funding: Private
Estimated Cost: Extreme
Staff: City Inspection Department, City Engineering Department, Private Engineers.
Background: Old and inadequate construction, buildings with unreinforced masonry to be mitigated.

Problem Identification: Lack of public awareness about earthquake damage prevention practices.

Goal W43 – Priority High

Objective W43.1 Educate community on earthquake damage prevention practices

Action: Produce and/or distribute handouts and provide inspections to identify shortcomings in earthquake preparedness.

Time Frame: 1 year+
Funding: none identified
Estimated Cost: $50,000
Staff: Fire Department, Inspection Department
Background: Having a community with residents educated on earthquake damage prevention practices will ensure greater safety of City residents.

Action: Educate the public on damage prevention practices for earthquakes

Time Frame: 2 years
Funding: Grants from state and Federal governments
Estimated Cost: $50,000-$75,000
Staff: Emergency Management and volunteers
Background: Starting up a C.E.R.T. program in the St. George City area. Earthquakes are taught as being the biggest hazard facing those in the area. Teaching the C.E.R.T. class should get the message out to residents.

Washington

Problem Identification: There are unmapped earthquake faults and ground shaking hazard areas.

Goal W44 – Priority High

Objective W44.1 Map all earthquake faults in Washington City and groundshaking hazard areas

Action: Create a Geologic Hazards Map showing earthquake faults and groundshaking hazard areas.

Time Frame: 6 months – 1 year
Funding: City General Fund
Estimated Cost: $5,000
Staff: Consultants, Washington City Public Works and Community Development Depts.
Background: Not all earthquake faults within the city have been mapped. For public safety, need to map faults and areas that could be impacted with rockfall, etc. due to groundshaking. The map will be a guide for siting homes and buildings

Capability Assessment

Introduction

This portion of the Plan assesses Beaver, Iron, Garfield, Kane, and Washington Counties, in Utah's current capacity to mitigate the effects of the natural hazards. The assessment includes a comprehensive examination of the following local government capabilities:

1. Staff & Organizational Capability
2. Technical Capability
3. Policy & Program Capability
4. Fiscal Capability
5. Legal Authority
6. Political Willpower

The purpose of conducting this capabilities assessment is to identify potential hazard mitigation opportunities available to the Five County's through its operation as a local government. Analysis should detect any existing gaps, shortfalls or weaknesses within existing government activities that could exacerbate community vulnerability. The assessment will also highlight the positive measures already in place or being done at the County level, which should continue to be supported and enhanced if possible through future mitigation efforts. The capabilities assessment serves as the foundation for designing an effective hazard mitigation strategy. It not only helps establish the goals and objectives for each County to pursue under this Plan, but ensures that those goals and objectives are realistically achievable under given local conditions.

Beaver County has three incorporated towns: Beaver, Milford, and Minersville, and four unincorporated communities: Elk Meadows, Manderfield, Greenfield, and Adamsville. The population of the county is approximately 6,000. Beaver County has in land mass of 1,660,137 total acres, only 6.9% of which is under private ownership. The remaining 93.1% is state and federally owned.

Garfield County has eight incorporated towns: Panguitch, Hatch, Antimony, Escalante, Boulder, Henrieville, Cannonville, and Tropic – and one unincorporated city of Ticaboo. The population of the county is approximately 4,600. Garfield County has a land mass of 3,372,717 total acres, only 4% of which is under private ownership. The remaining 96% is state and federally owned.

Iron County is the only county of the five counties that shares a border with all four other counties. It has six incorporated towns: Cedar City, Enoch, Parowan, Kanarraville, Paragonah, and Brian Head, and several unincorporated communities including: Newcastle, Beryl Junction, Modena, and Summit. The population of the County is approximately 43,000. Iron County has a land mass of 3,300 sq. miles.

Kane County is located in South Central Utah on the border with Arizona. With 3,992 square miles Kane County has a population of 6,062 (2000 census). Elevations range from 3700 feet above sea level on the Eastern border to 10,000 plus in the North Western corner of the County. Only 4% of the land area of Kane County is owned by private individuals with the remaining 96% owned by the State and Federal governments. 108 miles of Highway 89 run through Kane County representing the major transportation route between Salt Lake City and Phoenix. The Glen Canyon National Recreation Area and Lake

Powell are on the Eastern Border with Bryce Canyon National Park and Zion National Park in the Western portion of the County. The Grand Staircase Escalante National Monument and Paria Wilderness Area are also located in Kane County. Tourism is a major impact to the County with literally millions of visitors traveling through the County to visit the numerous National Parks, Wilderness Area's, Monument's or the several Marina's on Lake Powell.

Washington County occupies the extreme southwest corner of the State of Utah. With a land area of 2427 square miles with a population of 105,000 (2003 est.), It is the 15th largest by area and 5th largest by population. There are fourteen cities with St. George City being the largest with a population of 60,000 (2003 estimate). The Bureau of Land Management is the largest land holder in the county. There is also the Shivwits Indian Reservation to the west of Ivins City which encompasses 36 square miles. Washington County is bisected by Interstate 15 highway going north to south with tourism being a large part of the economy.

1. Staff & Organizational Capability

All five Counties have limited staff and organizational capability to implement hazard mitigation strategies. Each County is governed by a three-member Board of Commissioners who bear the responsibility of serving the people and improving the quality of life in the county. Terms on the board are staggered with elections held every two years. The County Commission directs and supervises the administration of all county offices, boards, commissions and agencies. The County has a number of professional staff departments to serve their residents and to carry out day-to-day administrative activities. The county also contracts with outside agencies and private entities to fill gaps and to increase their capabilities.

The full time county departments include the following: Assessor – All Counties
Attorney – All Counties
Building – All Counties
Clerk/Auditor – All Counties
Geographic Info. Systems – Washington Information Technology - All Counties
Justice Court – All Counties
Library - Washington
Mosquito Abatement - Washington
Planning – All Counties
Public Works – Washington
Recorder – All Counties
Roads – All Counties
Sheriff – All Counties
Treasurer – All Counties
Emergency Services – All Counties
County Public Health Dept. – All Counties
Cooperative Extension Services – All Counties
Special Service Districts – All Counties

The Assessor's Office is responsible to assess and value real and personal property within the county keeps records and, creates the tax role.

The County Attorney's Office provides legal advice to the county and prosecutes criminal activities.

The Clerk/Auditor's Office handles the registration of voters and elections throughout the county, provides passport applications and audits county departments.

Geographic Information Systems provides mapping and geographical analysis for county agencies and departments.

Emergency Services is responsible for the mitigation, preparedness and response operations that deal with both natural and man-made disasters.

The Treasurer's Office is responsible for the oversight and management of the County's budget and fiscal programs, including the administration of state and federal grants.

Information Technology provides for the hardware and software support throughout the county for computers, telephones, networks and e-mail services.

The Justice Court Assists Law Enforcement in administering equitable justice in the enforcement of local and state laws.

The County Library system has four libraries throughout the county to provide services to the population of the county.

The Planning Department among other things oversees the unincorporated areas of the county. Providing building permits, zoning ordinances and is the first step in obtaining business licenses.

Public Works coordinates public involvement with the physical infrastructure of the county. Also oversees GIS and Planning.

The Office of Recorder is a repository of local records.

The Roads Department maintains the roads throughout the county, through maintenance and implementation of engineering standards.

The Washington County Sheriffs Office maintains law enforcement throughout the unincorporated areas of the county and by contract for several of the incorporated municipalities. The Sheriffs office also maintains the jail in Washington County.

The County Treasurer receives and disburses monies for the county, its agencies and departments.

Health Department functions are provided by The Southwest Utah Health Department of the State of Utah.

The Utah State University Cooperative Extension office seeks to help individuals, families, and communities put research-based knowledge to work to improve their lives.

Special Service Districts provide various functions and services to the citizens of the county.

2. Technical Capability

Beaver, Kane, and Garfield Counties have limited technical capability to implement hazard mitigation strategies.

Iron County has some technical capability to implement hazard mitigation strategies.

Washington County has the technical capability to implement some of the hazard mitigation strategies planned.

Technical Expertise

Beaver and Garfield Counties have three deputies certified for clandestine lab detection, cleanup, etc.
Beaver and Garfield Counties have Information Technology departments that includes a Geographic Information Systems (GIS) Specialist. Beaver and Garfield Counties have been collecting GPS and photographic data on County C and D roads for the past four years and has made inroads into converting property description information contained in the Counties tax program into computer-generated plats.

Iron County has four deputies certified for clandestine lab detection, cleanup, etc.
Iron County has an Information Technology department that includes a Geographic Information Systems (GIS) Specialist. Iron County has been working on a county wide addressing system.

Kane County has numerous talented employees that assist with Hazard mitigation. The lack of financial resources limits the capabilities of these individuals. Kane County currently has limited GIS capability in its Road Department.

Washington County has a full-time emergency manager, planner, building inspector, and public works manager on staff to administer the County's hazard mitigation programs. The County has a licensed engineer on staff, and has in the past and currently relies upon outside contractors and consultants to perform a majority of any required technical work.
Washington County does have a department responsible for Information Technology (IT) to enhance local government operations and the County's ability to develop and maintain a state-of-the-art hazard mitigation program.
Washington County does currently have GIS capability.

Geographic Information Systems (GIS)
GIS systems can best be described as a set of tools (hardware, software and people) used to collect, manage, analyze and display spatially-referenced data. Many local governments are now incorporating GIS systems into their existing planning and management operations.

Internet Access
Beaver County provides the majority of its employees with high speed broadband internet access through State of Utah routers, gateways, and TCP/IP ranges. Internet access opens up an enormous door for local officials and departments to keep abreast of the latest information relative to their work and makes receiving government services more affordable and convenient. The State ITS also hosts Beaver County's website at www.beaver.state.ut.us. Garfield County provides the majority of its employees with high speed broadband internet access through State of Utah routers, gateways, and TCP/IP ranges. Internet access opens up an enormous door for local officials and departments to keep abreast of the latest information relative to their work and makes receiving government services more affordable and convenient. The State ITS also hosts Garfield County's website at *www.brycecanyoncountry,com.*

Iron County provides the majority of its employees with high speed broadband internet access through State of Utah routers, gateways, and TCP/IP ranges. Internet access opens up an enormous door for local officials and departments to keep abreast of the latest information relative to their work and makes receiving government services more affordable and convenient. The State ITS also hosts Iron County's website at www.Ironcounty.net

Kane County provides high speed broadband internet access to all county departments and employees by tying in to the State of Utah routers, gateways, and TCP/IP ranges or through a local ISP. Local citizens of the county have access through a variety services, ranging from dial-up services to Local T-1 services. The County is very fortunate to have several proactive local vendors that provide and support computer services.

Washington County provides high speed broadband internet access to all county departments and employees by tying in to the State of Utah routers, gateways, and TCP/IP ranges. Local citizens of the county have access through a variety services, ranging from dial-up services to Local T-1 services. Washington County's website is www.washco.state.ut.us

3. Fiscal Capability

All the Five Counties have limited fiscal capability to implement hazard mitigation strategies.

The following budgeted sums of money are from Beaver County's 2003 budget year.

Civil Defense	$12,000
Planning, Building, & Zoning	60,000
Public Health Department	28,000
Sheriff Training	8,000
Fire Suppression	36,000

The following budgeted sums of money are from Garfield County's 2003 budget year.

Civil Defense	$12,000
Planning, Building, & Zoning	3,500
Public Health Department	20,187
Sheriff Training	5,500
Fire Suppression	60,459

The following budgeted sums of money are from Iron County's 2003 budget year.

Civil Defense	$18,000
Planning, Building, & Zoning	75,000
Public Health Department	35,000
Sheriff Training	8,000
Fire Suppression	50,000

These amounts reflect the actual cost of maintaining the services. Any large scale, traumatic natural or man-made disaster would be only minimally covered by these funds.

Kane County has limited fiscal capability to implement hazard mitigation strategies. The County's annual budget is less than 4,000,000 and only 750,000 of that is a result of property taxes. Any large scale, traumatic natural or man-made disaster would be only minimally covered by these funds.

For Fiscal Year 2003, Washington County has a budget of $17,274,500, of which half are directly obligated to public safety, health and welfare for its citizens. Washington County receives most of its revenues through taxes.

These amounts reflect the actual cost of maintaining the services. Any large scale, traumatic natural or man-made disaster would be only minimally covered by these funds. It is highly unlikely that Iron County could afford to implement additional hazard mitigation programs.

It is highly unlikely that any of the Five Counties could afford to implement all of the planned hazard mitigation grant programs.

Under the Disaster Mitigation Act of 2000, FEMA has made special accommodations for "small and impoverished communities", who will be eligible for a 90% Federal share,10% non-Federal cost split for projects funded through the Pre-Disaster Mitigation Grant Program.

4. Policy & Program Capability
This part of the capabilities assessment includes the identification and evaluation of existing plans, policies, practices, programs, or activities that either increase or decrease the community's vulnerability to natural hazards. A complete review of all activities needs to be conducted throughout each county. Positive activities, which decrease hazard vulnerability, should be sustained and enhanced if possible. Negative activities which increase hazard vulnerability should become targeted for reconsideration, and be thoroughly addressed within the Mitigation Strategy for each of the Five Counties.

Recent Hazard Mitigation Efforts

Beaver and Garfield Counties have undertaken a few specific hazard mitigation efforts in the past. Activities include:

- Forming of the Local Emergency Planning Committee (LEPC), under the direction of the Beaver County Sheriff

- Establishment and implementation of Enhanced 911 services through Beaver County Sheriff Dispatch

- Practical training inside the county's (disaster drills) at least annually, with all emergency personnel, paid and volunteer, including Search and Rescue, EMTs, Fire District Personnel, Sheriff Department Personnel, and Hospital Personnel

- Practical training by professional programs outside the county's

- Implementation of Certified Emergency Response Team (CERT) program in the County's

Iron County has undertaken a few specific hazard mitigation efforts in the past. Activities include:

- Forming of the Local Emergency Planning Committee (LEPC), under the direction of the Iron County Sheriff
- Establishment and implementation of Enhanced 911 services through Dept. of Public Safety Dispatch
- Practical training inside the county (disaster drills) at least annually, with all emergency personnel, paid and volunteer, including Search and Rescue, EMTs, Fire Dept. Personnel, Sheriff Department Personnel, and Hospital Personnel
- Practical training by professional programs outside the county
- Implementation of Certified Emergency Response Team (CERT) program in the County

Kane County has a long history of Hazard Mitigation efforts through training and programs. These mitigation efforts are summarized as follows:

- Practical training inside the county (disaster drills) on a four year exercise schedule, with all emergency personnel, paid and volunteer, including Search and Rescue, EMS, Fire, Law Enforcement, and Hospital Personnel
- Practical training by professional programs outside the county
- Implementation of Certified Emergency Response Team (CERT) program in the County
- E911 implemented in the Kane County Sheriff's dispatch center in 1993
- An active Local Emergency Planning Committee since the early 1990's

Washington County has undertaken a few specific hazard mitigation efforts in the past. Activities include:

- Cleaning of culverts and drainage areas
- Transportation routes and maintaining roads

These recent mitigation efforts are summarized as follows:

- Washington County is subject to flash flooding due to its geography and weather patterns. The county has an ongoing mitigation project throughout the county keeping areas prone to flooding clear of debris.
- Washington County is in the process of identifying transportation routes that would be used in an evacuation. The Roads Department is in the process of upgrading roads that have been identified as major evacuation routes and upgrading signage

Washington County has five areas which are in need of mitigation planning and actions. These areas are:

- Flooding in Diamond Valley
- Flooding in Winchester Hills
- Flooding in Apple Valley
- Flooding in Dammeron Valley
- Flooding at Sky Ranch

Community Rating System Activities
Communities that regulate development in floodplains are able to participate in the National Flood Insurance Program (NFIP). In return, the NFIP makes federally-backed flood insurance policies available for properties in the community. The Community Rating System (CRS) was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. There are ten CRS classes: class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction.

Currently only Washington County has two communities that are participating in this program; St. George City and Santa Clara City. See appendix.

General Plan

Beaver and Iron Counties General Plan were originally completed in 1993 and amended in 1999. Additionally, their County's Zoning Ordinance was implemented in 1993. These plans have been reviewed for purposes of this Hazard Mitigation Plan, with special attention paid to those portions that address natural hazards. According to the Plans, there are no significant man-made hazards in either Beaver or Iron Counties.

Garfield County's General Plan was originally completed in 1984 and amended in 1999. Additionally, Garfield County's Zoning Ordinance was implemented in 1984. These plans have been reviewed for purposes of this Hazard Mitigation Plan, with special attention paid to those portions that address natural hazards. According to the Plans, there are no significant man-made hazards in Garfield County.

Kane County's General Plan was originally completed in the mid 1990's. Additionally, Kane County's Zoning Ordinance was amended in the late 1990's. These plans have been reviewed for purposes of this Hazard Mitigation Plan, with special attention paid to those portions that address natural hazards. According to the Plans, there are no significant man-made hazards in Kane County.

Beaver, Iron and Kane Counties' general vision statements under their General Plans include the following four main themes:

- *Beaver/Garfield/Iron/Kane Counties' desire to preserve the rural appearance of each respectable county*

- *Beaver/Garfield/Iron/Kane County's envision the protection of the natural environment through the provision of the public water and sewer infrastructure*

- *Beaver/Garfield/Iron/Kane County's desire to create more job opportunities to entice County young people to stay and live in each County or return to the County to work after attending college/university or serving in the military or on a Church Mission*

- *Beaver/Garfield/Iron/Kane County's envision a greater focus on developing their tourism industry*

After completing a thorough review of the *Beaver/Garfield/Iron/Kane* County General Plan and the *Beaver/Garfield/Iron/Kane* County Zoning Ordinance, it was determined that there are no pending hazard mitigation strategies for the County's to implement, and, considering this current mitigation planning effort, there are no foreseeable conflicts with the goals previously established under plans. There is, however, a significant opportunity to enhance hazard mitigation objectives for Beaver/Garfield/Iron/Kane County within this Hazard Mitigation Plan - objectives that go beyond any content within the General Plans and the Subdivision Ordinances.

In summary, the *Beaver/Garfield/Iron/Kane* County's General Plans and the Zoning Ordinances provide some general information with regard to natural hazards and post-disaster recovery procedures but do not specifically recommend hazard mitigation strategies for *Beaver/Garfield/Iron/Kane* County to implement. Rather, these documents serve to underscore and reiterate the following main points under what has been classified as either resource protection or storm hazard mitigation:

- *Beaver/Garfield/Iron/Kane County's generally support, but reserve the right to object to amendments and/or changes thereto, the guidelines of the State of Utah and the efforts and programs of the incorporated areas are to each County*

- *Beaver/Garfield/Iron/Kane County's support enforcement of the Utah State Building Code, particularly requirements of construction standards to meet wind resistive factors, i.e., design wind velocity. The County's will also support provisions in the State Building Code requiring tie-downs for mobile homes, which help resist wind damage.*

- *Beaver/Garfield/Iron/Kane County's support the National Flood Insurance Program*

- *Beaver/Garfield/Iron/Kane County's support the use of best management practices recommendations of the United States Soil Conservation Service*

Washington County's General Plan was originally completed in 1994, then again in 2003. The General Plan has been reviewed for purposes of this Hazard Mitigation Plan, with special attention paid to those portions which address natural hazards.

Washington County's general vision statement under the General Plan includes the following main themes:

- Washington County desires to preserve the rural way of life that is currently within the county.

- Washington County desires to create more job opportunities to entice County young people to stay and live in the County or return to the County to work after attending college or university or serving in the military.

- Washington County envisions a greater focus on developing its tourism industry.

Emergency Operations Plan

Kane County's Emergency Operations plan was first adopted in the late 1980's. It was revised in 1992 and has been reviewed several times since. The plan is currently being re-written to include a Terrorism Annex. For the most part, the Plan describes the County's capabilities to respond to emergencies and establishes the responsibilities and procedures for responding effectively to the actual occurrence of a disaster. The Plan does not specifically address hazard mitigation, but it does identify the operations to be undertaken by the County to protect lives and property immediately before, during and immediately following an emergency.

Washington County's Emergency Operations plan was first adopted in the early 1990s. It was revised in 1998 and completely rewritten in 2003. For the most part, the Plan describes the County's capabilities to respond to emergencies and establishes the responsibilities and procedures for responding effectively to the actual occurrence of a disaster. The Plan does not specifically address hazard mitigation, but it does identify the operations to be undertaken by the County to protect lives and property immediately before, during and immediately following an emergency.

5. Legal Authority

Local governments in Utah have a wide range of tools available to them for implementing mitigation programs, policies and actions. A hazard mitigation program can utilize any or all of the four broad types of government powers granted by the State of Utah, which are (a) Regulation; (b) Acquisition; (c) Taxation; and (d) Spending. Thus, this portion of the capabilities assessment will summarize the Counties enabling legislation which grants the four types of government powers listed above within the context of available hazard mitigation tools and techniques.

General Police Power

Utah's local governments have been granted broad regulatory powers in their jurisdictions. Utah General Statutes bestow the general police power on local governments, allowing them to enact and enforce ordinances that define, prohibit, regulate or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people and to define and abate nuisances, including public health nuisances. Since hazard mitigation can be included under the police power (as protection of public health, safety and welfare), towns, cities, and counties may include requirements for hazard mitigation in local ordinances. Local governments may also use their ordinance-making power to abate Nuisances, & which could include, by local definition, any activity or condition making people or property more vulnerable to any hazard.

Title 3, Fire Health, Safety, and Welfare, of Beaver County's Revised Ordinances as of September 30, 2003, includes Chapter 3-100, Nuisances; Chapter 3-200, Licensing and Regulation of Large Public Assemblies; Chapter 3-300, Flying Vehicles; Chapters 3-420 through 3-440, Adopting Mechanical Code, Plumbing Code, and National Electrical Code; and Chapter 3-500, Fires - Department - Code.

Residents of Beaver County are served by the Beaver County Sheriff's Department, the Minersville Town Marshall, and the Utah Highway Patrol. The Beaver County Sheriff's Department consists of a sheriff and thirteen full-time deputies, all of whom are certified peace officers. Their training and duties cover all facets of law enforcement from routine traffic control to criminal investigation. Continuous training is available to assist in upgrading the skills of the department. Deputies are assigned to strategic locations in the county, which serves to minimize response time. To assist in responding to emergencies or other needs, the department is staffed with four fully-trained and certified dispatchers. The department is in constant communication with other law enforcement agencies.

In addition, Beaver County operates a Public Safety Facility, under the direction of the Beaver County Sheriff, that includes a 197-bed jail that houses county and state inmates. Twenty-three full-time Corrections Officers that are fully trained through Peace Officers Standards Training (POST) staff the jail.

Beaver City and Milford contract with the Beaver County Sheriff's Department for Law Enforcement, while Minersville has a Town Marshall who serves as a deputy sheriff.

The Utah Highway Patrol has six full-time troopers, including a K-9 unit, stationed within Beaver County. They are certified and trained police officers with state-wide jurisdiction. Each trooper has assigned to him a police vehicle that is fully equipped. Their basic assignment is traffic enforcement within Beaver County.

Residents of Garfield County are served by the Garfield County Sheriff's office, and the Utah Highway Patrol. The Garfield County Sheriff's Office consists of a sheriff and six full-time deputies, and four part-time deputies all of whom are certified peace officers.
Their training and duties cover all facets of law enforcement from routine traffic control to criminal investigation. Continuous training is available to assist in upgrading the skills of the department. Deputies are assigned to strategic locations in the county, which serves to minimize response time. The department is in constant communication with other law enforcement agencies.

In addition, Garfield County operates a Public Safety Facility, under the direction of the Garfield County Sheriff, which includes a 115-bed jail that houses county and state inmates. Nineteen full-time Corrections Officers that are fully trained through Peace Officers Standards Training (POST) staff the jail.

The Cities of Panguitch and Escalante contract with the Garfield County Sheriff's Office for Law Enforcement.

The Utah Highway Patrol has three full-time troopers stationed within Garfield County. They are certified and trained police officers with state-wide jurisdiction. Each trooper has assigned to him a police vehicle that is fully equipped. Their basic assignment is traffic enforcement within Garfield County.

Residents of Iron County are served by the Iron County Sheriff's Department, the Brian Head Town Marshall, Enoch Police Department, Cedar City Police Department, and the Utah Highway Patrol. The Iron County Sheriff's Department consists of a sheriff and thirteen full-time deputies, all of whom are certified peace officers. Their training and duties cover all facets of law enforcement from routine traffic control to criminal investigation. Continuous training is available to assist in upgrading the skills of the department. Deputies are assigned to strategic locations in the county, which serves to minimize response time.

The cities/towns of Kanarraville, Paragonah, Summit, New Castle, and outlying communities in the county contract with the Iron County Sheriff's Department for Law Enforcement.

The Utah Highway Patrol has six full-time troopers stationed within Iron County. They are certified and trained police officers with state-wide jurisdiction. Each trooper has assigned to him a police vehicle that is fully equipped. Their basic assignment is traffic enforcement within Iron County.

Land Use

Regulatory powers granted by the state to local governments are the most basic manner in which a local government can control the use of land within its jurisdiction. Through various land use regulatory powers a local government can control the amount, timing, density, quality, and location of new development. All these characteristics of growth can determine the level of vulnerability of the community in the event of a natural hazard. Land use regulatory powers include the power to engage in planning, enact and enforce zoning ordinances, flood plain ordinances, and subdivision controls. Each local community possesses great power to prevent unsuitable development in hazard-prone areas.

A large portion of Washington/Kane County that is identified as open space is also land that is under jurisdiction of one of the public agencies, i.e. The National parks, National Forest, Bureau of Land Management, Indian Reservation, State Lands and State Parks. Over the years there has been good cooperation between these Federal and State agencies with Washington/Kane County.

A sizable amount of private land within the County is located in identified flood plain areas. Floodplain ordinances have been enacted to eliminate and mitigate losses in those areas.

Planning

In order to exercise the regulatory powers conferred by the General Statutes, local governments in Utah are required to create or designate a planning agency. The planning agency may perform a number of duties, including: make studies of the area; determine objectives; prepare and adopt plans for achieving those objectives; develop and recommend policies, ordinances, and administrative means to implement plans; and perform other related duties. While the ordinance itself may provide evidence that zoning is being conducted in accordance with a plan, the existence of a separate planning document ensures that the government is developing regulations and ordinances that are consistent with the overall goals of the community.

Beaver and Garfield County's Planning and Zoning Department and the Planning and Zoning Commissions have put together a comprehensive Zoning Ordinance and General Plans for Beaver and Garfield County's, approved by their County Commissions. Beaver and Garfield County's have also formed a Local Emergency Planning Committee with county-wide membership, under the direction of the Beaver and Garfield County's Sheriff, which has adopted and is in the process of updating, a comprehensive emergency management plan for each County.

Iron County's Planning and Zoning Department and the Planning and Zoning Commission have put together a comprehensive Zoning Ordinance and General Plan for Iron County, approved by the County Commission. Iron County has also formed a Local Emergency Planning Committee with county-wide membership, under the direction of the Iron County Sheriff, which has a comprehensive emergency management plan for the County.

Kane County has enacted a Planning Commission to oversee zoning and building in the unincorporated parts of the county. The planning commission may perform a number of duties, including: make studies of the area; determine objectives; prepare and adopt plans for achieving those objectives; develop and recommend policies, ordinances, and administrative means to implement plans; and perform other related duties

Washington County has enacted a Planning Department to oversee zoning and building in the unincorporated parts of the county.

Building Codes & Inspection
Many structural mitigation measures involve constructing and retrofitting homes, businesses and other structures according to standards designed to make the buildings more resilient to the impacts of natural hazards. Many of these standards are imposed through the building code.

Beaver County has adopted the state building code and has established a Building Inspections Department to carry out its building inspections in the unincorporated area of the County and Milford and Minersville municipalities. Beaver City has its own Building Inspector.

Garfield County has adopted the state building code and has established a Building Inspections Department to carry out its building inspections.

Iron County has adopted the state building code and has established a Building Inspections Department to carry out its building inspections in the unincorporated area of the County. Cedar City has its own Building Inspector.

Kane County has adopted by ordinance The International Building Code (IBC).

Washington County has adopted by ordinance The International Building Code (IBC).

Zoning
Zoning is the traditional and most common tool available to local governments to control the use of land. The statutory purpose for zoning is to promote health, safety, morals, or the general welfare of the community. Land "uses" controlled by zoning include the type of use (e.g., residential, commercial, industrial) as well as minimum specifications for use such as lot size, building height and set backs, density of population, etc.

Subdivision Regulations
Beaver County has adopted the Beaver County Subdivision Ordinance, as revised, November, 1996. This ordinance regulates the divisions of land for the purpose of complying with the Beaver County General Plan.

Garfield County has adopted the Garfield County Subdivision Ordinance, as revised, April, 2003. This ordinance regulates the divisions of land for the purpose of complying with the Garfield County General Plan.

Flood Plain Regulations
The Flood Insurance Rate Map (FIRM) produced by FEMA on September 19, 1987, determines that the entire community of unincorporated areas in Beaver County are rated Zone D, areas of undetermined but possible flood hazards.

Iron County has several Zone A areas within incorporated and unincorporated parts of the county.

Washington County has several Zone A areas within incorporated and unincorporated parts of the county.

6. Political Willpower

Most Beaver and Garfield County residents are quite knowledgeable about the potential hazards that their community faces, and in recent years they have become more familiar with the practices and principles of mitigation. Flood prone structures have become elevated and/or acquired and relocated or replaced out of harm's way. Classes in Fire Prevention, Brush Clearing, Tree Trimming, and Burning of Slash are available to Beaver and Garfield County residents through the Beaver Fire District. It is strongly believed that such tangible and visual changes within the community have created a greater sense of awareness among local residents, and that hazard mitigation is a concept that they are beginning to readily accept and support. Because of this fact, coupled with Beaver and Garfield County's history with natural disasters, it is expected that the current and future political climates are favorable for supporting and advancing future hazard mitigation strategies.

Most Iron County residents are quite knowledgeable about the potential hazards that their community faces, and in recent years they have become more familiar with the practices and principles of mitigation. Flood prone structures have become elevated and/or acquired and relocated or replaced out of harm's way. Classes in Fire Prevention, Brush Clearing, Tree Trimming, and Burning of Slash are available to Iron County residents through the State Fire Warden. It is strongly believed that such tangible and visual changes within the community have created a greater sense of awareness among local residents, and that hazard mitigation is a concept that they are beginning to readily accept and support. Because of this fact, coupled with Iron County's history with natural disasters, it is expected that the current and future political climates are favorable for supporting and advancing future hazard mitigation strategies.

The Kane County government is quite knowledgeable about the potential hazards that their community faces, and in recent years, they have become more familiar with the practices and principles of mitigation. It is strongly believed that such tangible and visual changes within the community have also created a greater sense of awareness among local residents, and that hazard mitigation is a concept that they are beginning to readily accept and support. Because of this fact, coupled with Kane County's history with natural disasters, it is expected that the current and future political climates are favorable for supporting and advancing future hazard mitigation strategies.

The Washington County government is quite knowledgeable about the potential hazards that their community faces, and in recent years, they have become more familiar with the practices and principles of mitigation. It is strongly believed that such tangible and visual changes within the community have also created a greater sense of awareness among local residents, and that hazard mitigation is a concept that they are beginning to readily accept and support. Because of this fact, coupled with Washington County's history with natural disasters, it is expected that the current and future political climates are favorable for supporting and advancing future hazard mitigation strategies.

Plan Maintenance
Monitoring, Evaluating and Updating the Plan

Periodic monitoring and reporting of the Plan is required to ensure that the goals and objectives for the Five County (FCAOG) Region are kept current and that local mitigation efforts are being carried out. The Plan has therefore been designed to be user-friendly in terms of monitoring implementation and preparing regular progress reports.

Annual Reporting Procedures

The Plan shall be reviewed annually, as required by the Steering Committee, or as situations dictate such as following a disaster declaration. Each year the FCAOG Community & Economic Development Department Staff will review the plan and ensure the following:

1. The Executive Director and the Steering Committee will receive an annual report and/or presentation on the implementation status of the Plan at the January Steering Committee Meeting.

2. The report will include an evaluation of the effectiveness and appropriateness of the mitigation actions proposed in the Plan.

3. The report will recommend, as appropriate, any required changes or amendments to the Plan.

If the FCAOG Steering Committee determines that a modification of the Plan is warranted, the Council may initiate a Plan amendment.

Revisions and Updates

Periodic revisions and updates of the Plan are required to ensure that the goals and objectives for the Southwest Region are kept current. More importantly, revisions may be necessary to ensure the Plan is in full compliance with Federal regulations and State statutes. This portion of the Plan outlines the procedures for completing such revisions and updates.

Five (5) Year Plan Review

The entire plan including any background studies and analysis should be reviewed every five (5) years to determine if there have been any significant changes in the Southwest Region that would affect the Plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques and changes to Federal or State legislation are examples of changes that may affect the condition of the Plan.
The Natural Hazard Mitigation Plan Regional Team, with a potential membership representing every jurisdiction in the FCAOG area, will be reconstituted for the five (5) year review/update process. Typically, the same process that was used to create the original plan will be used to prepare the update.

Further, following a disaster declaration, the Plan will need to be revised to reflect on lessons learned or to address specific circumstances arising out of the disaster.

The results of this five (5) year review should become summarized in the annual report prepared for this Plan under the direction of the Community & Economic Development Director. The annual report will include an evaluation of the effectiveness and appropriateness of the Plan, and will recommend, as appropriate, any required changes or amendments to the Plan.

If the Steering Committee determines that the recommendations warrant modification to the Plan, the Council may either initiate a Plan amendment as described below, or, if conditions justify, may direct the FCAOG Community & Economic Development Department to undertake a complete update of the Plan.

Plan Amendments

An amendment to the Plan should be initiated only by the Steering Committee, either at its own initiative or upon the recommendation of the Executive Director, Community & Economic Development Director or Mayor of an affected community.

Upon initiation of an amendment to the Plan, Five County AOG will forward information on the proposed amendment to all interested parties including, but not limited to, all affected city or county departments, residents and businesses. Depending on the magnitude of the amendment, the full Regional Team may be reconstituted. At a minimum, the information will be made available through public notice in a newspaper of general circulation as well as on the Five County AOG Website at www.fcaog.state.ut.us Information will also be forwarded to the Utah Department of Public Safety, Division of Emergency Services and Homeland Security. This information will be sent out in order to seek input on the proposed Plan amendment for not less than a forty-five (45) day review and comment period.

At the end of the comment period, the proposed amendment and all review comments will be forwarded to the Executive Director (or his/her designee) for consideration. If no comments are received from the reviewing parties within the specified review period, such will be noted accordingly. The Executive Director (or his/her designee) will review the proposed amendment along with comments received from other parties and submit a recommendation to the Steering Committee within sixty (60) days.

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered:

1. There are errors or omissions made in the identification of issues or needs during the preparation of the Plan; and/or

2. New issues or needs have been identified which were not adequately addressed in the Plan; and/or

3. There has been a change in information, data or assumptions from those on which the Plan was based.

4. The nature or magnitude of risks has changed.

5. There are implementation problems, such as technical, political, legal or coordination issues with other agencies.

Upon receiving the recommendation of the Executive Director or his/her designee, the Steering Committee will hold a public meeting. The Steering Committee will review the recommendation (including the factors listed above) and any oral or written comments received at the public meeting. Following that review, the Steering Committee will take one of the following actions:

1. Adopt the proposed amendment as presented.
2. Adopt the proposed amendment with modifications.
3. Refer the amendment request back to the Executive Director for further consideration.
4. Defer the amendment request for further consideration and/or meeting.
5. Reject the amendment request.

Implementation through Existing Programs

Process

The Five County Association of Governments Natural Hazard Mitigation will be implemented in each community by local ordinances. These ordinances include the Zoning Ordinance and the Subdivision Ordinance. Athough these two ordinance are widely used, other means of implementing the Plan are through the Capital Improvement Plans (CIPs)and the General (or Comprehensive) Plans of each local jurisdiction. Observance of these plans and ordinances will serve to coordinate implementation efforts. It will be the responsibility of the Mayor, Council or Commissioners of each jurisdiction, as he/she/they see fit, to ensure these actions are carried out no later than the target dates unless reasonable circumstances prevent their implementation (i.e. lack of funding availability).

Funding Sources

Although all mitigation techniques will likely save money by avoiding losses, many projects are costly to implement. The Five County jurisdictions will continue to seek outside funding assistance for mitigation. This portion of the Plan identifies the primary Federal and State grant programs for Five County jurisdictions to consider, and also briefly discusses local and non-governmental funding sources.

Federal

The following federal grant programs have been identified as funding sources which specifically target hazard mitigation projects:

Title: Pre-Disaster Mitigation Program
Agency: Federal Emergency Management Agency

Through the Disaster Mitigation Act of 2000, Congress approved the creation of a national program to provide a funding mechanism that is not dependent on a Presidential Disaster

Declaration. The Pre-Disaster Mitigation (PDM) program provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and damage and destruction of property.

The funding is based upon a 75% Federal share and 25% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination. Special accommodations will be made for “small and impoverished communities”, who will be eligible for 90% Federal share/10% non-Federal.

FEMA provides PDM grants to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities:

- State and local hazard mitigation planning
- Technical assistance (e.g. risk assessments, project development)
- Mitigation Projects
- Acquisition or relocation of vulnerable properties
- Hazard retrofits
- Minor structural hazard control or protection projects
- Community outreach and education (up to 10% of State allocation)

Title: Flood Mitigation Assistance Program
Agency: Federal Emergency Management Agency

FEMA’s Flood Mitigation Assistance program (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 USC 4101) with the goal of reducing or eliminating claims under the NFIP.

FMA is a pre-disaster grant program, and is available to states on an annual basis. This funding is available for mitigation planning and implementation of mitigation measures only, and is based upon a 75% Federal share/25% non-Federal share. States administer the FMA program and are responsible for selecting projects for funding from the applications submitted by all communities within the state. The state then forwards selected applications to FEMA for an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

Title: Hazard Mitigation Grant Program
Agency: Federal Emergency Management Agency

The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistant Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration.

To meet these objectives, FEMA can fund up to 75% of the eligible costs of each project. The state or local cost-share match does not need to be cash; in-kind services or materials may also be used. With the passage of the Hazard Mitigation and Relocation Assistance Act of 1993, federal funding under the HMGP is now based on 15% of the federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster.

The HMGP can be used to fund projects to protect either public or private property, so long as the projects in question fit within the state and local governments overall mitigation strategy for the disaster area, and comply with program guidelines. Examples of projects that may be funded include the acquisition or relocation of structures from hazard-prone areas, the retrofitting of existing structures to protect them from future damages; and the development of state or local standards designed to protect buildings from future damages.

Eligibility for funding under the HMGP is limited to state and local governments, certain private nonprofit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. These organizations must apply for HMPG project funding on behalf of their citizens. In turn, applicants must work through their state, since the state is responsible for setting priorities for funding and administering the program.

Title: Public Assistance (Infrastructure) Program, Section 406
Agency: Federal Emergency Management Agency

FEMA's Public Assistance Program, through Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, provides funding to local governments following a Presidential Disaster Declaration for mitigation measures in conjunction with the repair of damaged public facilities and infrastructure. The mitigation measures must be related to eligible disaster related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. These opportunities usually present themselves during the repair/replacement efforts.

Proposed projects must be approved by FEMA prior to funding. They will be evaluated for cost effectiveness, technical feasibility and compliance with statutory, regulatory and executive order requirements. In addition, the evaluation must ensure that the mitigation measures do not negatively impact a facility's operation or risk from another hazard.

Public facilities are operated by state and local governments, Indian tribes or authorized tribal organizations and include:

- Roads, bridges & culverts
- Drainage & irrigation channels
- Schools, city halls & other buildings
- Water, power & sanitary systems
- Airports & parks

Private nonprofit organizations are groups that own or operate facilities that provide services otherwise performed by a government agency and include, but are not limited to the following:

- Universities and other schools
- Hospitals & clinics
- Volunteer fire & ambulance
- Power cooperatives & other utilities
- Custodial care & retirement facilities
- Museums & community centers

Title: SBA Disaster Assistance Program
Agency: US Small Business Administration

The SBA Disaster Assistance Program provides low-interest loans to businesses following a Presidential disaster declaration. The loans target businesses to repair or replace uninsured disaster damages to properties owned by the businesses, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible, along with non-profit organizations.

SBA loans can be utilized by the recipient to incorporate mitigation techniques into the repair and restoration of their business.

Title: Community Development Block Grants
Agency: US Department of Housing and Urban Development

The Community Development Block Grant (CDBG) program provides grants to local governments for community and economic development projects that primarily benefit low- and moderate-income people. The CDBG program also provides grants for post-disaster hazard mitigation and recovery following a Presidential disaster declaration. Funds can be used for activities such as acquisition, rehabilitation or reconstruction of damaged properties and facilities and for the redevelopment of disaster areas.

State Programs

Local Programs

Local governments depend upon local property taxes as their primary source of revenue. These taxes are typically used to finance services that must be available and delivered on a routine and regular basis to the general public. If local budgets allow, these funds are used to match Federal or State grant programs when required for large-scale projects.

Non-governmental Programs

Another potential source of revenue for implementing local mitigation projects are monetary contributions from non-governmental organizations, such as private sector companies, churches, charities, community relief funds, the Red Cross, hospitals, Land Trusts and other non-profit organizations.

Paramount to having a plan deemed to be valid is its implementation. There is currently no new fiscal note attached to the implementation of this Plan.

Continued Public Involvement

Throughout the planning process, public involvement has been and will be critical to the development of the Plan and its updates. On a yearly basis the plan will be profiled at a Five County Open House. The plan will also be available on the FCAOG website to provide additional opportunities for public participation and comment.

Five County Association of Governments staff has been designated by its Steering Committee as the lead agency in preparing and submitting the Five County Natural Hazard Mitigation Plan, which includes coverage for all incorporated cities and counties within the five county region, i.e. Beaver, Garfield, Iron, Kane and Washington Counties. The strategy of the Association of Governments in preparing the plan is to use available resources and manpower in the most efficient and cost effective manner to allow our cities and counties continued access to data, technical planning assistance and FEMA eligibility. In addition, the AOG will reach out to non-profits, public agencies, special needs organizations, groups and individuals in allowing them input and access to the plan. With limited resources, however, it becomes difficult to both identify and to individually contact the broad range of potential clients that may stand to benefit from the plan. This being the case, we have established the following course of action:

STEP 1. All meetings directly related to the Natural Hazard Mitigation Plan process will be publicly advertised. Executive Council meetings where plan items are discussed and where actions are taken will not receive special notifications as they are already advertised according to set standards. All interested parties are welcome and invited to attend such meetings as they are public and open to all. The FCAOG will advertise each meeting and request for input at least seven days in advance of the activity and will publish notices of the event in The Spectrum newspaper. The notices will advertise both the meetings and the means of providing input outside the meetings if an interested person is unable to attend.

STEP 2. The AOG has established a mailing list of many local agencies and individuals that may have an interest in the Natural Hazard Mitigation Plan. Each identified agency or person will be mailed a notice of the meetings and open houses.

STEP 3. Comments, both oral and written, will be solicited and accepted from any interested party. Comments, as far as possible, will be included in the final draft of the Natural Hazard Mitigation Plan; however, the AOG reserves the right to limit comments that are excessively long due to the size of the Plan.

STEP 4. Specific to risk assessment and hazard mitigation, needs analysis, and capital investment strategies, the AOG will make initial contact and solicitation for input from each incorporated jurisdiction within the region. All input is voluntary. Staff time and resources do not allow personal contact with other agencies or groups, however, comments and strategies are welcome as input to the planning process from any party via regular mail, FAX, e-mail, phone call, etc. In addition, every public jurisdiction advertises and conducts public meetings on their planning, budget, etc. where most of these mitigation projects are initiated. Input can be received from these prime sources by the region as well.

STEP 5. The final draft of the Natural Hazard Mitigation Plan will be presented to the Five County Executive Council at its regularly scheduled monthly meeting for adoption and approval to submit the document to State authorities. Executive Council policies on adoption or approval of items will be in force and adhered to. This document is intended to be flexible and in constant change so comments can be taken at any time of the year for consideration and inclusion in the next update. Additionally, after FEMA approval of the Plan, the Plan will be promulgated for each local jurisdiction for adoption by resolution.

STEP 6. The following policies will guide AOG staff in making access and input to the Hazard Mitigation Plan as open and convenient as possible:

A. Participation: All citizens of the region are encouraged to participate in the planning process, especially those who may reside within identified hazard areas. The AOG will take whatever actions possible to accommodate special needs of individuals including the impaired, non-English speaking, persons of limited mobility, etc.

B. Access to Meetings: Adequate and timely notification to all area residents will be given as outlined above to all forums, and meetings.

C. Access to Information: Citizens, public jurisdictions, agencies and other interested parties will have the opportunity to receive information and submit comments on any aspect of the Natural Hazard Mitigation Plan, and/or any other documents prepared for distribution by the Five County Association of Governments that may be adopted as part of the plan by reference. The FCAOG may charge a nominal fee for printing of documents that are longer than three pages.

D. Technical Assistance: Residents as well as local jurisdictions may request assistance in accessing the program and interpretation of mitigation projects. AOG staff will assist to the extent practical, however, limited staff time and resources may prohibit staff from giving all the assistance requested. The AOG will be the sole determiner of the amount of assistance given all requests.

E. Public meetings: The AOG will plan and hold public meetings according to the following priorities: 1- Meetings will be conveniently timed for people who might benefit most from Mitigation programs, 2- Meetings will be accessible to people with disabilities (accommodations must be requested in advance according to previously established policy), and 3- Meetings will be adequately publicized. Meetings may be held for a number of purposes or functions including to: a-identify and profile hazards, b-develop mitigation strategies, and c-review plan goals, performance, and future plans.

F. Comment Period: The AOG will sponsor a 30-day public comment period prior to final plan submission. The comment period will begin with a public meeting to open the 30-day solicitation of input. Comments may be made orally, or in writing, and as far as possible, will be included in the final Natural Hazard Mitigation Plan according to the outlined participation rules.

Appendices

Appendix A-Environmental Considerations

National Environmental Policy Act (NEPA) Words in *italics* have been taken directly from the 44Code of Federal Regulations Parts 201 and 206: 44 CFR 10.8(d)(2)(iii) excludes this rule from the preparation of an environmental assessment or environmental impact statement, where the rule relates to actions that qualify for categorical exclusions under 44 CFR 10.8(d)(2)(iii), such as the development of plans under this section.
Executive Order 12898, Environmental Justice: Section 323 requires compliance with applicable codes and standards in repair and construction, and use of safe land use and construction standards.

The following acts will be taken into consideration and will be incorporated when needed while organizing and implementing the PDM plan; Historic Preservation, Clean Water, Clean Air, Wetland Preservation 404, Endangered Species Act, Description of natural and beneficial functions of floodplains.

National Historic Preservation Act of 1966: This act was found and declared by Congress because "the spirit and direction of the Nation are founded upon and reflected in its historic heritage…the historical and cultural foundations of the Nation should be preserved as a living part of our community life and development in order to give a sense of orientation to the American people." Some of the other main points of the act include the awareness of historic properties that are being lost or substantially altered. The preservation will continue a legacy of cultural, educational, aesthetic, inspirational, economic, and energy benefits for future generations. The knowledge of historic resources and "the encouragement of their preservations will improve the planning and execution of Federal and federally assisted projects and will assist economic growth and development. The act would like to use measures that will foster conditions in which historic resources can exist in productive harmony with present and future generations.

Clean Water Act (CWA): The Federal Water Pollution Control Act or Clean Water Act provides environmental protection of U.S. surface waters. The Clean Water Act's mission is to "reduce and maintain the chemical, physical, and biological integrity of the nation's waters". This act established a priority to end the discharge of pollutants into waterways. The principle requirements of the law were that each state had to adopt water quality standards, design plans for limiting industrial and municipal discharges, and act to protect wetlands. Nearly every city in the United States was required to build and operate a wastewater treatment plant with most of the technical and financial assistance coming from the EPA.

Water Quality Act of 1987: The water quality act reaffirmed and supported the Clean Water Act by focusing on stringent regulations of toxic chemicals from industry, acid rain, and water pollution from dispersed sources such as agricultural runoff, sewage overflows during storms, and runoff from city streets.

Wetland Preservation, Section 404 of the Clean Water Act: This act regulates activities in wetland areas. Amendments have included exemption categories, the option of delegation to states, and enforcement powers. This act regulates the discharge of dredged or fill material into "waters of the United States", which include wetland areas. The discharge or dredged material requires a permit from the U.S.

Army Corps of Engineers (Corps) based on regulatory guidelines developed in coincidence with the EPA. The “veto authority” of the Corps gives them the power to prohibit or restrict a defined area as a disposal site if it is determined that the discharge may cause adverse effects on municipal water supplies, shellfish beds and fishery areas, wildlife, and/ or recreational areas.

1990 Clean Air Act: A federal law that covers the entire country under the Environmental Policy Act (NEPA). This law sets limits or standards on how much of a pollutant can be in the air anywhere in the United States, controlling the emissions of air pollutants. These limits ensure that all Americans have the same basic health and environmental protections. States may have stronger pollution controls on an individual basis. However, states are not allowed to have weaker pollutions controls than those set for the whole country. Each state explains how it will do its job under the Clean Air Act by developing a mandated “state implementation plan” (SIP). The SIP is a collection of the regulations a state will use to clean up polluted areas that fail to meet air quality standards and to maintain air quality in areas that have attained standards. These plans must be developed involving the public through meetings that allow for opportunities to comment. The SIP must be approved by the EPA. If it is not approved the EPA can enforce the Clean Air Act in that state. The United States government, through the EPA, assists the states with the SIP by providing scientific research, expert studies, engineering designs and money to support clean air programs.

Clean Air Act Amendments of 1990, Section 112r the Risk Management Plan (RMP) Program: This act requires facilities with large amounts of certain hazardous chemicals to have special emergency planning requirements. These requirements necessitate the facilities to assess their own potential for serious chemical spills, fires, and explosions. Based on these assessments they have to prepare an RMP. In the RMP vital information for workers and communities is included. Such information includes hazard identification, hazard assessments, the design and maintenance of a safe facility, taking the steps necessary to prevent releases and to minimize the consequences if an accidental release occurs. Other sections were added to the CAA for acid rain, the protection of the ozone layer, permits, and existing sections were strengthened to improve air pollution control.

Endangered Species Act of 1973: Congress finds and declares that various species of fish, wildlife, and plants in the United States have been caused to become extinct, or are so depleted in numbers they are in danger of becoming extinct, as a result of economic development and expansion without adequate concern for conservation. Aesthetic, ecological, educational, historical, recreational, and scientific importance come from these species and are a value to our nation and its people. The U.S. will conserve, to a practicable extent, the species that face extinction and will encourage the States through federal assistance to develop and maintain conservation programs. The reason for the Act is to provide a means in which ecosystems with endangered and threatened species will be conserved. It is also declared that all state and local agencies resolve water resource issues in connection with conservation of endangered species. (SOURCE: http://endangered.fws.gov/esa.html)

Description of natural and beneficial functions of floodplains

(SOURCE: http://www.usbr.gov/recman/cmp/cmp-p01.htm)

Floodplain Management Policy: To pursue and encourage appropriate use of floodplains. The main points of the policy are to reduce the loss of life and property and the disruption of societal and economic pursuits caused by flooding or facility operations as well as to restore, sustain, and enhance the natural resources, ecosystems, and other functions of the floodplains. Activities will search for a balance between the, sometimes competing, uses of floodplains in a way that makes the most benefit to society.

Appendix B-Public Participation & Planning Process

A public participation component is necessary, and should be a strong, component to any planning process. Public participation gives citizens the opportunity to voice their opinions and state their interests. The Five County Association of Governments Natural Hazard Mitigation Plan includes a public participation component. The Federal Emergency Management Agency also requires public input during the development of Natural Hazard Mitigation plans.

The Five County Association of Governments Natural Hazard Mitigation Plan incorporates a variety of citizen input representing a cross-section of our area population. To this end the Five County Association of Governments developed a four-tiered public participation process: (1) developing a Regional Natural Hazard Mitigation Planning Team, to act as project steering committee, comprised of knowledgeable individuals from the community; (2) soliciting information from community leaders through a "Natural Hazards Assessment Questionnaire", (3) conducting stakeholder interviews to target the specialized knowledge of individuals working with populations or areas at risk from natural hazards; and (4) conducting County by County public workshops to identify common concerns and ideas regarding hazard mitigation and to discuss specific goals and actions of the mitigation plan. Within these four tiers, 12 steps are identified and outlined below:

Documentation of the Planning Process

This plan was prepared in the offices of the Five County Association of Governments by appointed staff members Curt Hutchings, Senior Planner and Project Manager, Gary Zabriskie, Associate Planner, and Ed Dickie, GIS Coordinator and was supported by Ryan Pietramali of DES. Other local agencies that aided in the process included city and county GIS departments in the Five County region. Elected officials including tribal leaders, local officials, emergency managers, police and fire staff members, planning departments, and local governmental agencies have all aided in the planning and implementation process. The planning process was based on Section 322 requirements of the Disaster Mitigation Act of 2000 and supporting guidance documents developed by FEMA and the Utah Division of Emergency Services and Homeland Security. The planning process included the following steps.

1. Organize Resources
2. Public Officials Outreach
3. Establish Continuity in the Planning Process
4. Data Acquisition
5. Hazard Risk Identification & Analysis
6. County Vulnerability Assessment
7. County Goals Assessment
8. Contact Regional Mitigation Emergency Managers (County & Tribal)
9. Mitigation Strategy Development
10. Prioritization of Identified Mitigation Strategies
11. State Plan Review
12. Adoption

Step I: Organize Resources The seven regional Associations of Governments (AOG) were recommended to conduct the planning efforts by the Utah League of Cities and Towns and the Governors office of Planning and Budget to ensure coordination with elected officials, emergency managers, planners, public works departments, and information technology specialists. Utah Division of Emergency Services and Homeland Security contracted the seven AOGs as sub-grantees to coordinate, develop, and write the seven multi-regional hazard mitigation plans under he planning guidelines included in the Disaster Mitigation Act of 2000.

The Five County Association of Governments established a regional planning team. The regional planning team, which was made up of individuals shown in Table 72, was the main constituent of the planning process from the initiation of the plan to the development and coordination to the resolution of the plan's adoption. Adjunct to the regional planning team a technical team comprised of representatives from all the various associations of governments was created on a technical level that is identified in Table 73. The Five County Association of Governments Steering Committee Table 74 was utilized to assure and affirm their respective county local inputs.

Table 72: Regional Planning Team

Member	Representing
Wayne Smith	Board of Commissioners-Iron County
Clare Ramsay	Board of Commissioners-Garfield County
Merrill Fisher	Mayor-Enterprise
Les Whitney	LEPC-Beaver County
Nathan Rousseau	LEPC-Garfield County
Charlie Morris	LEPC-Iron County
Dave Owens	LEPC-Kane County
Dean Cox	LEPC-Washington County
Mac Hall	Public Works-Hurricane City
Jim McGuire	Planning-Washington City
Bob Hansen	Fire/EMS-Santa Clara City
Bill Lund	Utah Geographical Survey
Steve Rundquist	Department of Emergency Services & Homeland Security
Keith Parke	Wild Land Fire Planning-FCAOG
Ed Dickie	GIS Coordinator-FCAOG GIS
Gary Zabriskie	Natural Hazard Mitigation Planning-FCAOG
Curt Hutchings	Project Manager-FCAOG

Table 73: Association of Governments Technical Team

Name	Organization
Ryan Pietramali	Utah Division of Emergency Services and Homeland Security
Lane Nielson	Wasatch Front Regional Council
LaNiece Dustman	Wasatch Front Regional Council
Jeff Adarns	Southeastern Utah Association of Governments
Jim Boes	Wasatch Front Regional Council
Jeff Gilbert	Bear River Association of Governments
Ken Sizemore	Five County Association of Governments
Curt Hutchings	Five County Association of Governments
Andrew Jackson	Mountainland Association of Governments
Emery Polelonema	Six County Association of Governments
Edwin Benson	Six County Association of Governments
Yankton Johnson	Uintah Basin Association of Governments

Table 74: Five County Association of Governments Steering Committee (Current for 2003)

Member	Representing
Commissioner Patrick Yardley	Beaver County Commission
Mayor Eugene H. Mayer	Milford City Corporation
Richard DeArmitt	Beaver County School District
Commissioner Dennis Stowell	Iron County Commission
Mayor Connie Robinson	Town of Paragonah
Alan Adams	Iron County School District
Commissioner Maloy Dodds	Garfield County Commission
Mayor Jean Seiler	Tropic Town Corporation
Bart Palmer	Garfield County School District
Commissioner Ray Spencer	Kane County Commission
Mayor Kim Lawson	Kanab City Corporation
Colene Brinkerhoff	Kane County School District
Commissioner Jim Eardley	Washington County Commission
Mayor Dan McGuire	Rockville Town Corporation
Larry C. Stephenson	Washington County School District
Jill Elliss	Dixie State College (Ex-Officio member)
Mark Barton	Southern Utah University (Ex-Officio Member)

Step 2: **Public Officials Outreach** To ensure the planning process had backing from the elected officials a representative from Five County Association of Governments met with each County Commission and each city mayor to inform them of the need for the plan and how it can better help the communities.

Step 3: **Establish Continuity in the Planning Process** Mitigation planning within Five County Association of Governments was part of a Pre-Disaster Mitigation Planning initiative to meet the requirements of the Disaster Mitigation Act of 2000. To meet this requirement the seven Associations of Government were contracted by the Division of Emergency Services and Homeland Security to assist the 29 counties with completion of a mitigation plan, which meets the requirements of sections 322. The Seven Associations of Government formed an AOG Technical Team to share ideas and ensure the plans were similar and that there was little duplication of effort. Planners from the Five County Association of Governments were involved with this committee. Please refer to Table 73 above.

Step 4: **Data Acquisition** Contact was made with designated personnel in each city and county to assess what data was available on the local level. Agreements were put in place, where needed, to allow the Association of Governments planning staff use of county and city data. Data layers obtained included some or all of the following: local roads, plot maps, county assessor's tax assessment data, hazard data, flood maps, topographic data, aerial photographs, and land development data.

Step 5: **Hazard Risk Identification and Analysis** This step was conducted by gathering data on the hazards that occurred in the planning area. This information was gathered from local, state, and federal agencies and organizations, as well as, from newspaper and other local media accounts, state and local weather records, conversations, surveys, interviews, and meetings with key informants within the planning area. Mitigation discussions were held during this process. During May and June 2003 the Association of Governments held public forums in each county, in part to discuss with the local community what hazard events had occurred and which hazards may pose a problem in the future. During these meetings, attendees had the opportunity to review general information on previous hazards and were given the opportunity to comment on them in a more specific manner. These meetings provided a forum for discussion on background information needed by FCAOG planners to gain a better understanding of the geography, geology, recreation, natural resources, and water resources of the Planning Area. These initial contacts with local entities also provided visual illustration of the planning area for planners of the Core Planning Team.

Step 6: **County Vulnerability Assessment** This step was conducted through a review of local base maps, topographical maps, floodplain maps, and other data. A detailed vulnerability analysis was completed with the use of Geographic Information Systems for each county within the Five County Association of Governments. HAZUS MH was used to determine vulnerability to earthquakes, for the hazards such as floods, landslides, and wildfire of loss estimation methodology was developed by the core planning team, with assistance from the Technical Team, to determine vulnerability to hazards. During these meetings attendees had the opportunity to review the specific information on all GIS products and to review areas of vulnerability in association with specific hazards.

Step 7: **Community Goals Assessment** This step was conducted through a review of the governing documents of the planning area, as well as, conversations, interviews, and meetings with key responsible individuals within the planning area. This step identified what goals are already established and adopted for the planning area and whether or not they promote or deter mitigation activities.

Step 8: **Contact Regional Mitigation Emergency Managers (County & Tribal)** Beaver, Garfield, Iron, Kane, and Washington Counties along with their respective communities were contacted to ascertain mitigation strategies. These counties and communities have volunteers and individuals with an interest in mitigation and public employees with technical expertise pertinent to mitigation. They include elected officials, county/city planners, county staff, and emergency managers. County emergency managers and their assistants were tasked with completing the Mitigation Strategies Workbook issued by the State Division of Emergency Services and Homeland Security. The Paiute Tribal emergency response council was also assigned to complete the workbook.

Step 9: **Mitigation Strategy Development** Developing the mitigation strategies was a process in which all of the previous steps were taken into account. Each County that participated in the County Pre-Disaster Mitigation Planning Grant was asked to evaluate the vulnerability assessment completed by Five County Association of Governments and complete a Mitigation Strategies that are incorporated into the Mitigation Strategies portion of this plan.

Step 10: **Prioritization of Identified Mitigation Strategies** The Disaster Mitigation Act of 2000 requires state, tribal, and local governments show how mitigation actions were evaluated and prioritized. This was completed by the AOGs with assistance from each county and city. Prioritization was done using the STAPLEE method explained in the FEMA How to Guide, 386-3, April 2003.

Step 11: **State Review** The Division of Emergency Services and Homeland Security pulled together a formal PDM plan review committee to insure local plans met the requirements of DMA 2000. This committee reviewed the plans from October 15 through November 1, 2003 and again from January 1 to January 15, 2004 subsequent to submission to FEMA for final review and acceptance.

Step 12: **Adoption** The plan went through a public adoption process on (date) and was adopted by:

Beaver County

- Beaver City, Town of Minersville, and Milford City.

Garfield County

- Panguitch City, Escalante City, Town of Cannonville, Town of Hatch, Town of Tropic, Town of Henrieville, Town of Boulder, and Town of Antimony.

Iron County

- Cedar City, Parowan City, Town of Paragonah, Town of Brian Head, Town of Kanarraville, and Enoch City.

Kane County

- City of Kanab, Town of Alton, Town of Glendale, Town of Orderville, and Town of Big Water.

Paiute Indian Tribe of Utah

- PITU Tribal Council, Cedar Band, Indian Peaks Band, Shivwits Band

Washington County

- City of St. George, Washington City, Santa Clara City, Town of Springdale, Town of Rockville, Town of New Harmony, Town of Leeds, Hildale City, Hurricane City, Ivins City, Toquerville City, Enterprise City, LaVerkin City, and the Town of Virgin.

A. Public Involvement

Public involvement opportunities were available throughout the design and completion of this plan. Such opportunities included: public forums in each county; completion of a hazards assessment questionnaire sent to each county and local government; various meetings with each county LEPC; meetings with each county's Mayors Association or Council of Governments; and other public meetings (refer to information provided below after step 12). Public comments taken from these public meetings were incorporated into the plan. Emergency managers, the Fire Department, Sheriff Department, State and Local Agencies, all community members that could be affected by a hazard within the region, business leaders, educators, non-profit organizations, private organizations, and other interested members were all a part of the planning process.

Information Sources

Many different sources of information were used in the development of this plan (see Appendix F for details).

Plan Methodology

The information in this mitigation plan is based on research from a variety of sources. FCAOG/DES conducted data research and analysis, facilitated steering committee meetings and public workshops, developed the final mitigation plan, and presented the plan for formal adoption with participating jurisdictions. The research methods and various contributions to the plan include:

State and federal guidelines and requirements for mitigation plans:

During the completion of this plan FCAOG examined and followed state and federal guidelines and requirements. These guidelines included FEMA planning standards, National Flood Insurance Program's Community Rating system, FEMA Flood Mitigation Assistance Program and various State reference material. A list of guidelines and requirements is as follows:

- FEMA Post Disaster Hazard Mitigation Planning Guidance DAP-12
- Disaster Mitigation Act of 2000
- 44 CRF parts 201 and 206, Interim Final Rule
- FEMA Region VIII "crosswalk"

Previous plans and studies:
FCAOG examined existing mitigation plans from around the country and incorporated numerous plans and studies from within the jurisdictions they serve.

Flood Damage Prevention Study Sevier River Basin Investigation, Utah US Army Corp of Engineers January 1994.
Utah Statewide Fire Risk Assessment Project
Natural Disaster Hazard Analysis, State of Utah Office of Emergency Services 1976
Salt Lake City Mitigation Plan 2002
State of Utah Mitigation Plan 1984, 1985, 1999 and 2001
State of Utah Wildfire Plan 2002
State of Utah Drought Plan
State of Utah Water Plan
Five County Flood Hazard Identification Study, August 2003
Emergency Operations Plans for Beaver, Garfield, Iron, Kane, and Washington Counties.
University of Utah Seismograph Stations History of Utah Earthquakes
National Weather Service "Flood and Flash Flood Deaths in Utah"
Snow and Avalanches in Utah Annual Report 2001-2002 Forest Service Utah Avalanche Center.
Town of Merrimack, New Hampshire Hazard Mitigation Plan 2002
Clackamas County Mitigation Plan 2002
Dunn County North Dakota Multi-Hazard Mitigation Plan 2001

Hazard Specific Research and Vulnerability Analysis Methodology

Geographic Information Systems (GIS) were used as the basic analysis tool to complete the hazard analysis for the Five County Association of Governments Pre-disaster Mitigation Plan. For most hazards a comparison was made between digital hazard data and census 2000 demographic information. Fortunately digital data exist statewide for landslides, quaternary faults, wildfire, dam locations, and epicenter locations. The goal of the vulnerability study is to estimate the number of homes, and infrastructure vulnerable to each hazard and assign a dollar value to this built environment. To this end, census data and natural hazard maps are the basic information used in the analysis. All the analysis takes place within the spatial context of a GIS. With the information available in spatial form, it is a simple task to overlay the natural hazards with census data to extract the desired information.

Earthquakes

HAZUS MH shorthand for Hazards United States Multi-Hazard was used to determine vulnerability as it relates to seismic hazards for the study area. The HAZUS-MH Earthquake Model is designed to produce loss estimates for use by federal, state, regional and local governments in planning for earthquake risk mitigation, emergency preparedness, response and recovery. The methodology deals with nearly all aspects of the built environment, and a wide range of different types of losses. Extensive national databases are embedded within HAZUS-MH, containing information such as demographic aspects of the population in a study region, square footage for different occupancies of buildings, and numbers and locations of bridges. Embedded parameters

Integrating public participation during the development of the Five County Association of Governments Natural Hazard Mitigation Plan has ultimately resulted in increased public awareness. Through citizen involvement, the mitigation plan reflects community issues, concerns, and new ideas and perspectives on mitigation opportunities and plan action items. What follows is an accounting of the meetings held during this process.

Detailed Accounting of Meetings

March 4, 2003
The Regional Natural Hazard Mitigation Planning Team met to discuss the basic format of the plan and to identify the hazard categories to be included within the plan. The team determined that hazard categories will include: Earthquake *(liquefaction, ground shaking, slope failure)*; Landslide *(slope failure, rock fall, problem soils, ground subsidence)*; Severe Storm *(avalanche)*; Wild Land Fire; Flooding; Drought; Volcanic Activity; and, Insect Infestation.

May 13, 2003
The Regional Team met to receive an update from Five County staff on what had been accomplished to date. The team was given a first run draft of the plan which included very rough outlines of the things that would be included in the plan. Maps which had been drafted to date were also presented to the group.

The Team expressed concerns over the types of hazards we are addressing in the plan. They were also concerned that the plan was titled “Pre-Disaster Mitigation” because some of the hazard areas which were previously agreed upon had very slim likelihood of ever being a disaster. The Team decided to include the following hazards in the plan: Wildfire; Landslide; Earthquake; Flood; Volcanism; Drought; Problem Soils; Severe Weather; Insect Infestation; and Radon Gas. This change also included a decision not to include mitigation measures for Volcanoes.

Of the hazard areas to be included, Wildfire, Landslide; Earthquake and flood will be addressed on a county level while the other areas will be analyzed on a region-wide level.

Natural Hazards Assessment Questionnaire

February 24, 2003
The “Natural Hazards Assessment Questionnaire” was mailed out to all County Commissions, County Clerks, City and Town Mayors, and Town Clerks. The questionnaire asked the recipient to utilize the best local information available to them to answer questions related to the occurrence and location of natural hazard events in their communities and the

likelihood of future events. A copy of the questionnaire is included in Appendix B. Maps were also included with the questionnaire with a request to identify the location of “Critical Facilities” in the community. A listing of critical facilities was included:

1 Hospital/Clinic
2 Fire Station
3 Sheriff/Police Station
4 School
5 Town Hall/Community Center
6 Airport
7 Bus Station
8 Water Tank
9 Sewer Facility
10 TV/Radio Facilities
11 Other Facilities, writing in the type of “other” facility)

March 24, 2003
Three copies, to accommodate the three bands located in our district, of the “Natural Hazards Assessment Questionnaire” were provided to the Paiute Indian Tribe of Utah (PITU) with a request and maps as given to the other communities.

County Workshops

April 14th through April 22nd, 2003
During this time period, a series of County meetings were held in conjunction with the Five County Association of Governments annual Human Services Public Forum. The purpose of the meetings was to inform the citizenry about the Natural Hazard Mitigation Planning Process, to solicit input regarding natural hazard events, and to gain information on types of mitigation policies and plans that would lessen the future impacts of hazard events. A map for each county was provided and the facilitator noted information received on the maps and flipcharts.

Notice and flyers were sent to County Commissioners, Mayors, County Emergency Managers, the Five County FEMA board, and the Human Services Council. Notice of the meetings was also provided to newspapers in each county.

During these workshops information was gathered on a number of hazard events which had occurred including earthquakes, fires, landslides, problem soils, karst, volcanic cones, insect problems, radon gas, flooding, drought, severe weather. Additionally, information was gathered as possible mitigation activities.

Planning

On March 6, 2003 Five County staff attended a meeting in Richfield with Six County staff and Ryan Pietramali to learn more about the requirements and process of Natural Hazard Mitigation planning. Five County staff left the meeting with a better understanding and several sources of information including two sections of a seven section Hazard Mitigation How-To booklet. Staff also received contact information and an outline of what should be included in the Plan

On March 24, 2003, staff met with Paiute Tribe representative Tara Marlow to ask for her response to a Natural Hazard questionnaire and for help in identifying Tribal Critical

Facilities. She said she will return them to us.

On April 8, 2003 the Five County Area Natural Hazard Mitigation Team met to give staff an opportunity to brief them on the requirements and process of the Natural Hazard Mitigation Plan. In addition, we discussed what hazards to include in the plan and to what degree they should be evaluated. A list of the members of the team is included in the acknowledgements.

During April & May, 2003 staff met with the Beaver, Garfield, Kane and Washington Counties Local Emergency Preparedness Committees (LEPC) to brief them on the requirements and process of the Natural Hazard Mitigation Plan and to ask for their assistance in drafting and reviewing the plan. Each group is agreeable to help with the project.

On June 10, 2003 staff met with the Five County Area Natural Hazard Mitigation Team. At this meeting the Team decided to change focus on the planning effort. The team questioned the overall direction of the plan and had some concerns. Five County staff agreed to have a state representative come to the next meeting of the team to help clear up confusion.

On July 1, 2003 Ryan Pietramali from DESHS addressed the Regional Team to help answer the teams concerns. The team left the meeting with a clearer focus and understanding of the requirements of the plan and of their role in the effort.

On July 17, 2003 staff met with the AOG Technical Team made up of members from each of the seven AOGs in the state. We discussed the flood study that is going forward through the Army Corp of Engineers and DESHS. We were told that a draft is pending and we should have it soon. We discussed the earthquake hazard analysis that is to be prepared by DESHS using “HAZUS” software and were told that the software has some bugs that are being worked out. We also discussed the budget and the possibility of funds being offered to each County EM, from the state, to help draft mitigation projects for the plan.

On July 25, staff met with the Iron County Local Emergency Preparedness Committees (LEPC) Co-chairman to brief him on the requirements and process of the Natural Hazard Mitigation Plan and to ask for their assistance in drafting and reviewing the plan. They are agreeable to help with the project.

On July 28, 2003 staff met with six County staff, the Army Corp of Engineers and state staff to go over a draft of the Flood study. The flood study covers areas of the state that are not mapped (flood areas) by FEMA and gives some possible mitigation measures to consider.

During the month of August, staff met with the LEPCs of all five counties. The main focus of these meetings was to determine the willingness of each group to help staff by drafting Mitigation Projects for their respective counties and communities. Staff stressed that, in order to make the process meaningful, individuals with knowledge about specific hazard areas and City and County representatives should be invited to participate. These meetings went very well in each county. Each LEPC will help to organize the meetings and Five County staff will be on hand to assist.

During the Month of September, staff met with the LEPCs of all five counties. These meetings were focused on beginning the process of drafting the Mitigation project portion of the plan. At the Beaver County meeting a large portion of the total mitigation projects were identified and drafted. Staff asked the members to contact City officials to get input on projects as no city representation was present. Garfield County LEPC members, at their meeting determined that they would assign each member a specific hazard to investigate and draft projects. Iron County also decided to give assignments similar to Garfield County. At the Kane County meeting more instruction was given and a target in October was scheduled to begin the project development process. Washington County participants decided to send the information out to individual communities and ask for input.

On October 3, 2003 staff met with the Washington County LEPC, and representatives from each community, to collect Mitigation project information that had been generated to date. The participants also met in small groups to prioritize individual community projects.

Public Participation- Mayors' Association, Tribal Council

On April 1 and 2, 2003 staff met with the Washington County Mayors' Association and the Iron County Coordinating Council respectively, to give an update on the Natural Hazard Mitigation process. A first draft of the plan was handed out. The draft was briefly discussed and an explanation of the purpose of the plan, highlighting the possibility of funding to accomplish mitigation projects, was given.

On October 1, 2003 staff met in conjunction with Six County staff, with the Tribal Council of the Paiute Indian Tribe of Utah to give an update on the Natural Hazard Mitigation process, and to discuss the best way to proceed with getting assistance from each Band in developing the Hazard Mitigation Projects for Tribal Lands. Staff was instructed to meet with each Band to get their input and help in drafting the projects. Staff will then bring the product to the Tribal Council for input/approval. Staff also identified the funding that will be more accessible to the Tribe through participation in the Plan. Staff also informed them that they will be asked to adopt the finished plan by resolution when the time comes.

On October 6th staff meet with the Beaver County and Kane County Councils of Governments respectively, and then on October 29th with the Garfield County Mayors Meeting to provide updated information on the Natural Hazard Mitigation Plan. Part of the presentation was to inform the members that the next step in the process is to have representatives from the Counties and each community draft Mitigation strategies to include in the plan. It was mentioned that each county and the Paiute Indian Tribe have all applied for mitigation grant funds to help them to complete the process. Staff also reminded the COGs that when the draft has received preliminary approval from FEMA, we will be asking for each community to adopt the plan.

FEMA Preliminary Approval and Plan Adoption by Towns, Cities and Counties

On January 27th, 2004, Five County Association of Governments staff mailed a final draft version of the Five County Natural Hazard Mitigation Plan to Ryan Pietramali with the State Department of Emergency Services and Homeland Security. Ryan reviewed the Plan one more time and sent it off to FEMA for Preliminary Approval (approval lacking only adoption by local communities and counties). FEMA staff reviewed the document and let State staff know that Five County had received Preliminary Approval.. This approval was relayed to Five County staff via Ryan Pietramali on Monday April 19th, 2004.

Five County staff then set out to encourage all jurisdictions within our region to adopt the Plan by resolution. This was accomplished through a series of steps outlined below:

Staff advertised two Open Houses, one held in the Five County Association of Governments Offices in St. George and the other in our Offices in Cedar City. The advertisement was 14 days in advance of the Open Houses. The purpose of the Open Houses was to invite interested persons to review and comment on the Plan prior to adoption by local communities and counties. The outcomes of the two Open Houses are included as Appendix I.

Five County staff attended meetings of each county's Council of Governments, Coordinating Council, or Mayor's Association and the Paiute Tribe to let the Mayors, County Commissioners and Tribal Leaders know about the preliminary approval and to ask them to take the plan to a public meeting to adopt it by resolution.

Adoption sheets were retrieved from the communities and counties and were added to Appendix J of this Plan.

Mitigation Strategies Development

On September 17th (Beaver County), October 3rd (Washington County), October 8th (Kane County), October 9th (Paiute Tribe), October 16th (Garfield County), October 31st (Iron County) staff meet with county LEPCs to start the process of developing mitigation strategies for the Plan. Each County was reminded that to complete the requirements of the funding they had applied for, they need to develop strategies for the county and its communities, keep minutes of the meetings dealing with the strategies, and provide a listing of those involved in the process. Beaver County decided to complete as much as they could at that meeting and follow up with additional information from each community. Washington County opted to hold a series of meetings with representatives from each community to provide input. Kane County determined to have each member of the committee follow up on specific issues with designated communities. The Paiute Tribe decided to have the Paiute Emergency Response Committee help draft the strategies and them bring the information before each band to get approval. After band approval the information will be presented to the Tribal Council during the approval process. Garfield County opted to have there committee members work with specific communities and Iron County held a series of meetings with city and town representatives to provide input.

Each County held subsequent meetings to get all the needed information and to draft the strategies. The AOG received strategies from each jurisdiction as a result.

Profile of General Demographic Characteristics: 2000

Table DP-1. Profile of General Demographic Characteristics: 2000
Geographic Area: Beaver County, Utah

[For information on confidentiality protection, non sampling error, and definitions, see text

]

Subject	Number	Percent
Total population	**6,005**	**100.0**
SEX AND AGE		
Male	3,090	51.5
Female	2,915	48.5
Under 5 years	558	9.3
5 to 9 years	551	9.2
10 to 14 years	557	9.3
15 to 19 years	512	8.5
20 to 24 years	396	6.6
25 to 34 years	690	11.5
35 to 44 years	753	12.5
45 to 54 years	704	11.7
55 to 59 years	257	4.3
60 to 64 years	192	3.2
65 to 74 years	430	7.2
75 to 84 years	304	5.1
85 years and over	101	1.7
Median age (years)	30.8	(X)
18 years and over	3,994	66.5
Male	2,059	34.3
Female	1,935	32.2
21 years and over	3,733	62.2
62 years and over	949	15.8
65 years and over	835	13.9
Male	376	6.3
Female	459	7.6
RACE		
One race	5,899	98.2
White	5,599	93.2
Black or African American	16	0.3
American Indian and Alaska Native	54	0.9
Asian	37	0.6
Asian Indian	1	-
Chinese	11	0.2
Filipino	11	0.2
Japanese	4	0.1
Korean	1	-
Vietnamese	1	-
Other Asian 1	8	0.1
Native Hawaiian and Other Pacific Islander	5	0.1
Native Hawaiian	1	-
Guamanian or Chamorro	-	-
Samoan	1	-
Other Pacific Islander 2	3	-
Some other race	188	3.1
Two or more races	106	1.8
Race alone or in combination with one or more other races:	***3***	
White	5,687	94.7
Black or African American	23	0.4
American Indian and Alaska Native	113	1.9
Asian	59	1.0
Native Hawaiian and Other Pacific Islander	19	0.3
Some other race	226	3.8

Subject	Number	Percent
HISPANIC OR LATINO AND RACE		
Total population	**6,005**	**100.0**
Hispanic or Latino (of any race)	333	5.5
Mexican	277	4.6
Puerto Rican	4	0.1
Cuban	1	-
Other Hispanic or Latino	51	0.8
Not Hispanic or Latino	5,672	94.5
White alone	5,491	91.4
RELATIONSHIP		
Total population	**6,005**	**100.0**
In households	5,803	96.6
Householder	1,982	33.0
Spouse	1,329	22.1
Child	2,200	36.6
Own child under 18 years	1,905	31.7
Other relatives	175	2.9
Under 18 years	85	1.4
Nonrelatives	117	1.9
Unmarried partner	52	0.9
In group quarters	202	3.4
Institutionalized population	202	3.4
Noninstitutionalized population	-	-
HOUSEHOLD BY TYPE		
Total households	**1,982**	**100.0**
Family households (families)	1,531	77.2
With own children under 18 years	819	41.3
Married-couple family	1,329	67.1
With own children under 18 years	686	34.6
Female householder, no husband present	138	7.0
With own children under 18 years	94	4.7
Nonfamily households	451	22.8
Householder living alone	406	20.5
Householder 65 years and over	226	11.4
Households with individuals under 18 years	865	43.6
Households with individuals 65 years and over	565	28.5
Average household size	2.93	(X)
Average family size	3.42	(X)
HOUSING OCCUPANCY		
Total housing units	**2,660**	**100.0**
Occupied housing units	1,982	74.5
Vacant housing units	678	25.5
For seasonal, recreational, or occasional use	399	15.0
Homeowner vacancy rate (percent)	4.8	(X)
Rental vacancy rate (percent)	19.5	(X)
HOUSING TENURE		
Occupied housing units	**1,982**	**100.0**
Owner-occupied housing units	1,566	79.0
Renter-occupied housing units	416	21.0
Average household size of owner-occupied units.	2.99	(X)
Average household size of renter-occupied units	2.69	(X)

- Represents zero or rounds to zero. (X) Not applicable.
1 Other Asian alone, or two or more Asian categories.
2 Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
3 In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.
Source: U.S. Census Bureau, Census 2000.

Table DP-1. Profile of General Demographic Characteristics: 2000

Geographic Area: Garfield County, Utah

[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent
Total population	**4,735**	**100.0**
SEX AND AGE		
Male	2,421	51.1
Female	2,314	48.9
Under 5 years	405	8.6
5 to 9 years	396	8.4
10 to 14 years	418	8.8
15 to 19 years	455	9.6
20 to 24 years	238	5.0
25 to 34 years	505	10.7
35 to 44 years	591	12.5
45 to 54 years	652	13.8
55 to 59 years	195	4.1
60 to 64 years	213	4.5
65 to 74 years	377	8.0
75 to 84 years	222	4.7
85 years and over	68	1.4
Median age (years)	33.8	(X)
18 years and over	3,190	67.4
Male	1,612	34.0
Female	1,578	33.3
21 years and over	3,018	63.7
62 years and over	791	16.7
65 years and over	667	14.1
Male	301	6.4
Female	366	7.7
RACE		
One race	4,665	98.5
White	4,496	95.0
Black or African American	8	0.2
American Indian and Alaska Native	87	1.8
Asian	19	0.4
Asian Indian	7	0.1
Chinese	1	-
Filipino	1	-
Japanese	8	0.2
Korean	1	-
Vietnamese	-	-
Other Asian 1	1	-
Native Hawaiian and Other Pacific Islander	2	-
Native Hawaiian	-	-
Guamanian or Chamorro	-	-
Samoan	1	-
Other Pacific Islander 2	1	-
Some other race	53	1.1
Two or more races	70	1.5
Race alone or in combination with one or more other races:	***3***	
White	4,562	96.3
Black or African American	9	0.2
American Indian and Alaska Native	119	2.5
Asian	35	0.7
Native Hawaiian and Other Pacific Islander	3	0.1
Some other race	85	1.8

Subject	Number	Percent
HISPANIC OR LATINO AND RACE		
Total population	**4,735**	**100.0**
Hispanic or Latino (of any race)	136	2.9
Mexican	96	2.0
Puerto Rican	1	-
Cuban	3	0.1
Other Hispanic or Latino	36	0.8
Not Hispanic or Latino	4,599	97.1
White alone	4,440	93.8
RELATIONSHIP		
Total population	**4,735**	**100.0**
In households	4,607	97.3
Householder	1,576	33.3
Spouse	1,047	22.1
Child	1,711	36.1
Own child under 18 years	1,430	30.2
Other relatives	157	3.3
Under 18 years	91	1.9
Nonrelatives	116	2.4
Unmarried partner	55	1.2
In group quarters	128	2.7
Institutionalized population	121	2.6
Noninstitutionalized population	7	0.1
HOUSEHOLD BY TYPE		
Total households	**1,576**	**100.0**
Family households (families)	1,199	76.1
With own children under 18 years	605	38.4
Married-couple family	1,047	66.4
With own children under 18 years	508	32.2
Female householder, no husband present	107	6.8
With own children under 18 years	67	4.3
Nonfamily households	377	23.9
Householder living alone	323	20.5
Householder 65 years and over	159	10.1
Households with individuals under 18 years	644	40.9
Households with individuals 65 years and over	451	28.6
Average household size	2.92	(X)
Average family size	3.43	(X)
HOUSING OCCUPANCY		
Total housing units	**2,767**	**100.0**
Occupied housing units	1,576	57.0
Vacant housing units	1,191	43.0
For seasonal, recreational, or occasional use	965	34.9
Homeowner vacancy rate (percent)	4.6	(X)
Rental vacancy rate (percent)	8.9	(X)
HOUSING TENURE		
Occupied housing units	**1,576**	**100.0**
Owner-occupied housing units	1,247	79.1
Renter-occupied housing units	329	20.9
Average household size of owner-occupied units	2.91	(X)
Average household size of renter-occupied units	2.99	(X)

- Represents zero or rounds to zero. (X) Not applicable.
1 Other Asian alone, or two or more Asian categories.
2 Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
3 In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.
Source: U.S. Census Bureau, Census 2000.

Table DP-1. Profile of General Demographic Characteristics: 2000

Geographic Area: Iron County, Utah

[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent
Total population.	**33,779**	**100.0**
SEX AND AGE		
Male.	16,757	49.6
Female.	17,022	50.4
Under 5 years	3,166	9.4
5 to 9 years	2,792	8.3
10 to 14 years	2,773	8.2
15 to 19 years	3,851	11.4
20 to 24 years	4,919	14.6
25 to 34 years	4,219	12.5
35 to 44 years	3,736	11.1
45 to 54 years	3,266	9.7
55 to 59 years	1,199	3.5
60 to 64 years	967	2.9
65 to 74 years	1,634	4.8
75 to 84 years	941	2.8
85 years and over	316	0.9
Median age (years)	24.2	(X)
18 years and over	23,232	68.8
Male.	11,231	33.2
Female.	12,001	35.5
21 years and over	20,116	59.6
62 years and over	3,464	10.3
65 years and over	2,891	8.6
Male.	1,316	3.9
Female.	1,575	4.7
RACE		
One race.	33,215	98.3
White	31,416	93.0
Black or African American	119	0.4
American Indian and Alaska Native	737	2.2
Asian	251	0.7
Asian Indian	19	0.1
Chinese.	34	0.1
Filipino	19	0.1
Japanese.	117	0.3
Korean.	45	0.1
Vietnamese.	1	-
Other Asian 1	16	-
Native Hawaiian and Other Pacific Islander. . . .	92	0.3
Native Hawaiian.	15	-
Guamanian or Chamorro	6	-
Samoan.	16	-
Other Pacific Islander 2	55	0.2
Some other race	600	1.8
Two or more races	564	1.7
Race alone or in combination with one or more other races:	***3***	
White	31,916	94.5
Black or African American	184	0.5
American Indian and Alaska Native	958	2.8
Asian	350	1.0
Native Hawaiian and Other Pacific Islander.	139	0.4
Some other race	822	2.4

Subject	Number	Percent
HISPANIC OR LATINO AND RACE		
Total population.	**33,779**	**100.0**
Hispanic or Latino (of any race)	1,383	4.1
Mexican.	1,005	3.0
Puerto Rican.	44	0.1
Cuban	5	-
Other Hispanic or Latino	329	1.0
Not Hispanic or Latino	32,396	95.9
White alone.	30,829	91.3
RELATIONSHIP		
Total population.	**33,779**	**100.0**
In households.	33,086	97.9
Householder	10,627	31.5
Spouse	6,822	20.2
Child.	11,839	35.0
Own child under 18 years	9,900	29.3
Other relatives	1,157	3.4
Under 18 years	463	1.4
Nonrelatives	2,641	7.8
Unmarried partner	278	0.8
In group quarters.	693	2.1
Institutionalized population.	247	0.7
Noninstitutionalized population	446	1.3
HOUSEHOLD BY TYPE		
Total households.	**10,627**	**100.0**
Family households (families).	8,073	76.0
With own children under 18 years	4,362	41.0
Married-couple family	6,822	64.2
With own children under 18 years	3,609	34.0
Female householder, no husband present	901	8.5
With own children under 18 years	574	5.4
Nonfamily households	2,554	24.0
Householder living alone	1,693	15.9
Householder 65 years and over	627	5.9
Households with individuals under 18 years	4,615	43.4
Households with individuals 65 years and over . .	1,973	18.6
Average household size.	3.11	(X)
Average family size.	3.45	(X)
HOUSING OCCUPANCY		
Total housing units.	**13,618**	**100.0**
Occupied housing units	10,627	78.0
Vacant housing units.	2,991	22.0
For seasonal, recreational, or occasional use.	1,986	14.6
Homeowner vacancy rate (percent).	4.1	(X)
Rental vacancy rate (percent).	7.0	(X)
HOUSING TENURE		
Occupied housing units	**10,627**	**100.0**
Owner-occupied housing units	7,040	66.2
Renter-occupied housing units	3,587	33.8
Average household size of owner-occupied units.	3.18	(X)
Average household size of renter-occupied units .	2.98	(X)

- Represents zero or rounds to zero. (X) Not applicable.
1 Other Asian alone, or two or more Asian categories.
2 Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
3 In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.
Source: U.S. Census Bureau, Census 2000.

Table DP-1. Profile of General Demographic Characteristics: 2000

Geographic Area: Kane County, Utah

[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent
Total population	**6,046**	**100.0**
SEX AND AGE		
Male	2,997	49.6
Female	3,049	50.4
Under 5 years	399	6.6
5 to 9 years	457	7.6
10 to 14 years	569	9.4
15 to 19 years	511	8.5
20 to 24 years	252	4.2
25 to 34 years	542	9.0
35 to 44 years	739	12.2
45 to 54 years	894	14.8
55 to 59 years	357	5.9
60 to 64 years	316	5.2
65 to 74 years	564	9.3
75 to 84 years	348	5.8
85 years and over	98	1.6
Median age (years)	39.1	(X)
18 years and over	4,269	70.6
Male	2,070	34.2
Female	2,199	36.4
21 years and over	4,047	66.9
62 years and over	1,183	19.6
65 years and over	1,010	16.7
Male	484	8.0
Female	526	8.7
RACE		
One race	5,961	98.6
White	5,804	96.0
Black or African American	2	-
American Indian and Alaska Native	94	1.6
Asian	13	0.2
Asian Indian	2	-
Chinese	3	-
Filipino	2	-
Japanese	4	0.1
Korean	-	-
Vietnamese	1	-
Other Asian 1	1	-
Native Hawaiian and Other Pacific Islander	3	-
Native Hawaiian	1	-
Guamanian or Chamorro	-	-
Samoan	1	-
Other Pacific Islander 2	1	-
Some other race	45	0.7
Two or more races	85	1.4
Race alone or in combination with one or more other races:	***3***	
White	5,882	97.3
Black or African American	6	0.1
American Indian and Alaska Native	146	2.4
Asian	24	0.4
Native Hawaiian and Other Pacific Islander	11	0.2
Some other race	67	1.1

Subject	Number	Percent
HISPANIC OR LATINO AND RACE		
Total population	**6,046**	**100.0**
Hispanic or Latino (of any race)	140	2.3
Mexican	86	1.4
Puerto Rican	2	-
Cuban	4	0.1
Other Hispanic or Latino	48	0.8
Not Hispanic or Latino	5,906	97.7
White alone	5,724	94.7
RELATIONSHIP		
Total population	**6,046**	**100.0**
In households	5,979	98.9
Householder	2,237	37.0
Spouse	1,446	23.9
Child	1,945	32.2
Own child under 18 years	1,651	27.3
Other relatives	202	3.3
Under 18 years	101	1.7
Nonrelatives	149	2.5
Unmarried partner	71	1.2
In group quarters	67	1.1
Institutionalized population	36	0.6
Noninstitutionalized population	31	0.5
HOUSEHOLD BY TYPE		
Total households	**2,237**	**100.0**
Family households (families)	1,629	72.8
With own children under 18 years	721	32.2
Married-couple family	1,446	64.6
With own children under 18 years	612	27.4
Female householder, no husband present	134	6.0
With own children under 18 years	85	3.8
Nonfamily households	608	27.2
Householder living alone	522	23.3
Householder 65 years and over	228	10.2
Households with individuals under 18 years	776	34.7
Households with individuals 65 years and over	698	31.2
Average household size	2.67	(X)
Average family size	3.21	(X)
HOUSING OCCUPANCY		
Total housing units	**3,767**	**100.0**
Occupied housing units	2,237	59.4
Vacant housing units	1,530	40.6
For seasonal, recreational, or occasional use	1,256	33.3
Homeowner vacancy rate (percent)	4.2	(X)
Rental vacancy rate (percent)	11.8	(X)
HOUSING TENURE		
Occupied housing units	**2,237**	**100.0**
Owner-occupied housing units	1,743	77.9
Renter-occupied housing units	494	22.1
Average household size of owner-occupied units	2.74	(X)
Average household size of renter-occupied units	2.43	(X)

- Represents zero or rounds to zero. (X) Not applicable.
1 Other Asian alone, or two or more Asian categories.
2 Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
3 In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.
Source: U.S. Census Bureau, Census 2000.

Table DP-1. Profile of General Demographic Characteristics: 2000

Geographic Area: Washington County, Utah

[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent
Total population	**90,354**	**100.0**
SEX AND AGE		
Male	44,561	49.3
Female	45,793	50.7
Under 5 years	8,229	9.1
5 to 9 years	7,413	8.2
10 to 14 years	7,682	8.5
15 to 19 years	8,598	9.5
20 to 24 years	6,755	7.5
25 to 34 years	10,202	11.3
35 to 44 years	10,019	11.1
45 to 54 years	8,632	9.6
55 to 59 years	3,654	4.0
60 to 64 years	3,827	4.2
65 to 74 years	8,255	9.1
75 to 84 years	5,562	6.2
85 years and over	1,526	1.7
Median age (years)	31.0	(X)
18 years and over	62,164	68.8
Male	30,179	33.4
Female	31,985	35.4
21 years and over	56,886	63.0
62 years and over	17,653	19.5
65 years and over	15,343	17.0
Male	7,258	8.0
Female	8,085	8.9
RACE		
One race	88,866	98.4
White	84,543	93.6
Black or African American	186	0.2
American Indian and Alaska Native	1,328	1.5
Asian	405	0.4
Asian Indian	55	0.1
Chinese	64	0.1
Filipino	78	0.1
Japanese	86	0.1
Korean	51	0.1
Vietnamese	27	-
Other Asian 1	44	-
Native Hawaiian and Other Pacific Islander	384	0.4
Native Hawaiian	74	0.1
Guamanian or Chamorro	5	-
Samoan	181	0.2
Other Pacific Islander 2	124	0.1
Some other race	2,020	2.2
Two or more races	1,488	1.6
Race alone or in combination with one or more other races:	***3***	
White	85,882	95.1
Black or African American	375	0.4
American Indian and Alaska Native	1,867	2.1
Asian	683	0.8
Native Hawaiian and Other Pacific Islander	663	0.7
Some other race	2,516	2.8

Subject	Number	Percent
HISPANIC OR LATINO AND RACE		
Total population	**90,354**	**100.0**
Hispanic or Latino (of any race)	4,727	5.2
Mexican	3,299	3.7
Puerto Rican	78	0.1
Cuban	31	-
Other Hispanic or Latino	1,319	1.5
Not Hispanic or Latino	85,627	94.8
White alone	82,293	91.1
RELATIONSHIP		
Total population	**90,354**	**100.0**
In households	88,995	98.5
Householder	29,939	33.1
Spouse	20,230	22.4
Child	31,532	34.9
Own child under 18 years	26,280	29.1
Other relatives	3,588	4.0
Under 18 years	1,423	1.6
Nonrelatives	3,706	4.1
Unmarried partner	747	0.8
In group quarters	1,359	1.5
Institutionalized population	832	0.9
Noninstitutionalized population	527	0.6
HOUSEHOLD BY TYPE		
Total households	**29,939**	**100.0**
Family households (families)	23,429	78.3
With own children under 18 years	11,095	37.1
Married-couple family	20,230	67.6
With own children under 18 years	9,108	30.4
Female householder, no husband present	2,386	8.0
With own children under 18 years	1,546	5.2
Nonfamily households	6,510	21.7
Householder living alone	5,230	17.5
Householder 65 years and over	2,663	8.9
Households with individuals under 18 years	11,831	39.5
Households with individuals 65 years and over	9,769	32.6
Average household size	2.97	(X)
Average family size	3.36	(X)
HOUSING OCCUPANCY		
Total housing units	**36,478**	**100.0**
Occupied housing units	29,939	82.1
Vacant housing units	6,539	17.9
For seasonal, recreational, or occasional use	4,364	12.0
Homeowner vacancy rate (percent)	3.8	(X)
Rental vacancy rate (percent)	7.3	(X)
HOUSING TENURE		
Occupied housing units	**29,939**	**100.0**
Owner-occupied housing units	22,128	73.9
Renter-occupied housing units	7,811	26.1
Average household size of owner-occupied units.	2.94	(X)
Average household size of renter-occupied units	3.05	(X)

- Represents zero or rounds to zero. (X) Not applicable.
1 Other Asian alone, or two or more Asian categories.
2 Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
3 In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.
Source: U.S. Census Bureau, Census 2000.

Appendix D - BCEGS Scores

Communities in the Five County Area Participating in the Building Code Effectiveness Grading Schedule

Community	County	BCEGS Classification	Date
BEAVER	BEAVER	BCEGS: PERS 04 COML 04	2000
BEAVER CO	BEAVER	BCEGS: PERS 03 COML 03	2002
BIG WATER	KANE	BCEGS: PERS 05 COML 05	1998
CEDAR CITY	IRON	BCEGS: PERS 04 COML 99	2000
ENOCH CITY	IRON	BCEGS: PERS 05 COML 05	2002
ENTERPRISE	WASHINGTON	BCEGS: PERS 03 COML 03	2002
GARFIELD CO	GARFIELD	BCEGS: PERS 06 COML 06	1997
HILDALE	WASHINGTON	BCEGS: PERS 99 COML 99	1999
HURRICANE	WASHINGTON	BCEGS: PERS 04 COML 04	2000
IRON CO	IRON	BCEGS: PERS 04 COML 04	2001
IVINS	WASHINGTON	BCEGS: PERS 04 COML 04	2002
KANAB	KANE	BCEGS: PERS 03 COML 03	2002
KANARRAVILLE	IRON	BCEGS: PERS 99 COML 99	1998
KANE CO	KANE	BCEGS: PERS 99 COML 05	2001
LA VERKIN	WASHINGTON	BCEGS: PERS 03 COML 03	2002
SPRINGVILLE	UTAH	BCEGS: PERS 04 COML 04	1999
ST GEORGE	WASHINGTON	BCEGS: PERS 04 COML 04	2000
WASHINGTON	WASHINGTON	BCEGS: PERS 05 COML 05	2002
WASHINGTON CO	WASHINGTON	BCEGS: PERS 03 COML 03	2000

Appendix E - NFIP Data

Communities in the Five County Area Participating in the National Flood Program

CID	Community Name	County	Date of Entry(Emer or Reg)	Current Effective Map
490243	Alton, town of	Kane County	(NSFHA)	07/10/85(R)
490001#	Beaver County*	Beaver County*	09/18/87(R)	09/18/87
490074#	Cedar City, city of	Iron County	10/16/84(R)	10/16/84
490067#	Escalante, town of	Garfield County	08/28/79(R)	08/28/79(m)
490065#	Garfield County *	Garfield County	08/05/86(R)	08/05/86(M)
490084A	Glendale, town of	Kane County	05/01/86(R)	05/01/86(L)
490068#	Hatch, town of	Garfield County	07/24/79(R)	07/24/79(M)
490069#	Henrieville, town of	Garfield County	09/25/79(R)	09/28/79(M)
490172	Hurricane, city of	Washington County	02/02/84(R)	(NSFHA)
490073#	Iron County *	Iron County	07/17/86(R)	07/17/86(M)
490173	Ivins, town of	Washington County	08/23/82(R)	(NSFHA)
490085#	Kanab, city of	Kane County	08/19/85(R)	08/19/85(M)
490077	Kanarraville, city of	Iron County	12/11/85(R)	(NSFHA)
490083#	Kane County *	Kane County	07/01/86(R)	07/01/86(L)
490174	LaVerkin, city of	Washington County	02/02/84(R)	(NSFHA)
490175	Leeds, town of	Washington County	(NSFHA)	02/02/84(R)
490003	Milford, city of	Beaver County	(NSFHA)	02/02/84(R)
490086	Orderville, town of	Kane County	(NSFHA)	02/02/84(R)
490070#	Panguitch, city of	Garfield County	08/28/79(M)	08/28/79(R)
490075#	Paragonah, town of	Iron County	09/24/84	09/24/84(R)
490076#	Parowan, city of	Iron County	03/18/86(M)	03/18/86(R)
490178#	Santa clara, city of	Washington County	12/06/99	08/05/86(R)
490180#	Toquerville, city of	Washington County	02/19/86(M)	02/19/86(R)
490071#	Tropic, town of	Garfield County	12/04179(M)	12/04/79(R)
490181A	Virgin, town of	Washington County	08/05/86(M)	08/05/86(R)
490224#	Washington County *	Washington County	03/18/86(M)	03/18/86(R)
490182#	Washington, city of	Washington County	09/30/93	07/01/87(R)

(R) - Indicates Entry In Regular Program
NSFHA - No Special Flood Hazard Area - All Zone C
> - Date Of Current Effective Map is after the Date Of This Report
* - Unincorporated Areas Only
Areas which have had special flood hazard areas identified --Not In The Program--

CID	community name	hazard area county	Identified	Date On Which Sanctions Apply
490066	antimony, town of	Garfield County	04/02/76	04/02/77
490002A	beaver, city of	Beaver County	04/01/77(F)	06/11/75
490171	hildale, town of	Washington County	06/04/76	06/04/77
490179#	springdale, town of	Washington County	05/10/77	05/10/78

N/A - Not Applicable At This Time
(S) - Suspended Community
(W) - Withdrawn Community
(F) - Effective Map Is A Flood Insurance Rate Map
* - Unincorporated Areas Only

Appendix F - Information Sources

Sources:

Map sources:

Regional Severe Weather – State of Utah Department of Emergency Services and Homeland Security

Regional Radon Gas – Utah Safety Council

Regional Insect Infestation – State of Utah Department of Emergency Services and Homeland Security

Regional Problem Soils – State of Utah Department of Emergency Services and Homeland Security

Regional Drought – State of Utah Department of Emergency Services and Homeland Security

Regional Earthquake – State of Utah Department of Emergency Services and Homeland Security

County Wildfire – Utah Division of Forestry, Fire and State Lands, Southwest Region

County Landslide – State of Utah Department of Emergency Services and Homeland Security

County Flood zone – FEMA, Digitized 100 year Flood zone maps.

Paiute Indian Tribe of Utah – FEMA, 100 year Flood zone maps. State of Utah Department of Emergency Services and Homeland Security. Utah Safety Council

Profile and History Sources:

Drought – U.S. Geological Survey Water-Supply Paper 2375, 591 p.

Landslides – Engineering & Environmental Geology of Southwestern Utah, Utah Geological Association Publication 21 – 1992 Field Symposium – Kim M. Harty, Editor.

Problem Soils – Engineering & Environmental Geology of Southwestern Utah, Utah Geological Association Publication 21 – 1992 Field Symposium – Kim M. Harty, Editor.

Floods – Engineering & Environmental Geology of Southwestern Utah, Utah Geological Association Publication 21 – 1992 Field Symposium – Kim M. Harty, Editor.

U.S. Geological Survey Water-Supply Paper 2375, 591 p.

Wildfire – State of Utah, Utah Division of Forestry, Fire and State Lands, Southwest Region

Insect Infestation – Utah Department of Agriculture and Food, 2002 Insect Report.

Radon Gas – Engineering & Environmental Geology of Southwestern Utah, Utah Geological Association Publication 21 – 1992 Field Symposium – Kim M. Harty, Editor. Utah Safety Council. Utah Safety Council

Severe Weather – NOAA

Earthquake – Engineering & Environmental Geology of Southwestern Utah, Utah Geological Association Publication 21 – 1992 Field Symposium – Kim M. Harty, Editor.

Volcanism – Engineering & Environmental Geology of Southwestern Utah, Utah Geological Association Publication 21 – 1992 Field Symposium – Kim M. Harty, Editor.

Appendix G-List of Acronyms

Local and Regional

FCAOG	Five County Association of Governments
FCAOGGIS	Five County Association of Governments, Geographic Information System

State

DESHS	Department of Emergency Services & Homeland Security
PITU	Paiute Indian Tribe of Utah
SHMO	State Hazard Mitigation Officer

Federal

AASHTO	American Association of State Highway and Transportation Officials
ATC	Applied Technology Council
b/ca	benefit/cost analysis
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BSSC	Building Seismic Safety Council
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CRS	Community Rating System
CVO	Cascade Volcano Observatory (USGS)
EDA	Economic Development Administration
EPA	Environmental Protection Agency
ER	Emergency Relief
EWP	Emergency Watershed Protection (NRCS Program)
FAS	Federal Aid System
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance (FEMA Program)
FTE	Full Time Equivalent
GIS	Geographic Information System
GNS	Institute of Geological and Nuclear Sciences (International)
GSA	General Services Administration
HAZUS	Hazards U.S.
HMGP	Hazard Mitigation Grant Program
HMST	Hazard Mitigation Survey Team
HUD	Housing and Urban Development (United States, Department of Housing & Urban Development
IBHS	Institute for Business and Home Safety
ICC	Increased Cost of Compliance
IHMT	Interagency Hazard Mitigation Team
NCDC	National Climate Data Center
NFIP	National Flood Insurance Program

NFPA	National Fire Protection Association
NHMP	Natural Hazard Mitigation Plan (also known as “409 Plan”)
NIBS	National Institute of Building Sciences
NIFC	National Interagency Fire Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
SBA	Small Business Administration
SEAO	Structural Engineers Association of Oregon
TDR	Transfer of Development Rights
UGB	Urban Growth Boundary
URM	Unreinforced Masonry
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFA	United States Fire Administration
USFS	United States Forest Service
USGS	United States Geological Survey
WSSPC	Western States Seismic Policy Council

Appendix H Federal funding Sources

The following grant sources may provide assistance to local governments or other eligible applicants for mitigation projects or planning.

- Hazard Mitigation Grant Program (HMGP)
  - Lead Agency: DES
  - Funding: Varies by disaster
  - Funding Formula: 75% federal: 25% non-federal
  - Funding Source: FEMA
  - Applicants: Public Sector (same as for Public Assistance)
  - Project Type: Natural Hazard Mitigation
  - Reference: www.fema.gov
- Pre-Disaster Mitigation Competitive (PDM-C) Grant Program
  - Lead Agency: DES
  - Funding: Annual
  - Funding Formula: 75% federal: 25% non-federal
  - Funding Source: FEMA
  - Applicants: Public Sector (same as for Public Assistance)
  - Project Type: Natural Hazard Mitigation, Planning
  - Reference: www.fema.gov
- Flood Mitigation Assistance (FMA) Program
  - Lead Agency: DES
  - Funding: Annual
  - Funding Formula: 75% federal: 25% non-federal
  - Funding Source: FEMA
  - Applicants: Public Sector (same as for Public Assistance)
  - Project Type: Flood Mitigation, Planning
  - Reference: www.fema.gov
- Disaster Resistant Universities (DRU) Program
  - Lead Agency: DES
  - Funding: Annual
  - Funding Formula: 75% federal: 25% non-federal
  - Funding Source: FEMA
  - Applicants: Public Post-Secondary Educational Institutions
  - Project Type: Natural Hazard Mitigation, Planning
  - Reference: www.fema.gov
- Small Business Administration (SBA) Pre-Disaster Mitigation Loans
  - Lead Agency: SBA
  - Funding: 5-year renewable
  - Funding Formula: Low interest loans (4% or less)
  - Funding Source: SBA
  - Applicants: Small Businesses
  - Project Type: General Natural Hazard Mitigation
  - Reference: Federal Register, Vol. 67, No. 194, pp 62335-62339
- State Fire Assistance – Wildland/Urban Interface (SFA-WUI)
  - Lead Agency: FFSL
  - Funding: Annual
  - Funding Formula: 50% federal : 50% non-federal
  - Funding Source: Combined Federal Agencies
  - Applicants: Public Sector

- Project Type: Wildland fire preparedness, prevention, and fuel reduction
- Reference: www.ffsl.utah.gov/communityfirepln.htm
- Contact davedalrymple@utah.gov

- Rural Fire Assistance (RFA)
  - Lead Agency: FFSL
  - Funding: Annual
  - Funding Formula: 90% federal : 10% non-federal
  - Funding Source: Department of the Interior
  - Applicants: Fire Departments
  - Project Type: Wildland fire education, training, equipment
  - Reference: www.ffsl.utah.gov/ufragrant.htm
  - Contact tracydunford@utah.gov
- Volunteer Fire Assistance (VFA)
  - Lead Agency: FFSL
  - Funding: Annual
  - Funding Formula: 90% federal : 10% non-federal
  - Funding Source: USFS
  - Applicants: Volunteer Fire Departments
  - Project Type: Organization, training, prevention, equipment
  - Reference: www.ffsl.utah.gov/ufragrant.htm
- Rural Community Assistance Economic Action Program (RCA EAP)
  - Lead Agency: FFSL
  - Funding: Annual
  - Funding Formula: 80% federal : 20% non-federal
  - Funding Source: USFS
  - Applicants: Public sector
  - Project Type: Utilization of forest products
  - Contact daveschen@utah.gov
- Forestland Enhancement Program (FLEP)
  - Lead Agency: FFSL
  - Funding: $100 Million over 5 years nationwide
  - Funding Formula: 75% federal : 25% non-federal
  - Funding Source: USFS
  - Applicants: Non-industrial private forest owners
  - Project Type: Forest ecosystem health (including fuel reduction)
  - Contact rongropp@utah.gov

Appendix I Open Houses

Appendix J Resolutions

RESOLUTION NO. __________

A RESOLUTION ADOPTING THE FIVE COUNTY ASSOCIATION OF GOVERNMENTS NATURAL HAZARD MITIGATION PLAN AS REQUIRED BY THE FEDERAL DISASTER MITIGATION AND COST REDUCTION ACT OF 2000.

WHEREAS, th President signed H.R. 707, the *Disaster Mitigation and Cost Reduction Act of 2000*, into law on October 30, 2000.

WHEREAS, the Disaster Mitigation Act of 2000 requires all jurisdictions to be covered by a Pre-Disaster Hazard Mitigation Plan to be eligible for Federal Emergency Management Agency post-disaster funds,

WHEREAS, Five County Association of Governments (FCAOG) has been contracted by the State of Utah to prepare a Pre-Disaster Mitigation Plan covering all of the jurisdictions in the FCAOGArea, and

WHEREAS, the FCAOG Executive Council approved FCAOG Staff to write the plan, and

WHEREAS, ** is within the FCAOG Area, and

WHEREAS, the ** Council is concerned about mitigating potential losses from natural disasters before they occur, and

WHEREAS, the plan identifies potential hazards, potential loses and potential mitigation measures to limit loses, and

WHEREAS, the ** Council has determined that it would be in the best interest of the community as a whole to adopt the Pre-Disaster Hazard Mitigation Plan as it pertains to the City, therefore

BE IT RESOLVED BY THE ** COUNCIL THAT:

The attached “Five County Association of Governments Natural Hazard Mitigation Plan” be adopted to meet the requirements of the Disaster Mitigation and Cost Reduction Act of 2000.

This Resolution shall be effective on the date it is adopted.

DATED this __________ day of ______________________, 2004.

____
**, Mayor
**

ATTEST:

____
**, Recorded